
THE PAN-PACIFIC ENTOMOLOGIST

Published by the
Pacific Coast Entomological Society
in cooperation with
The California Academy of Sciences

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San Francisco, California

1951

THE PAN-PACIFIC ENTOMOLOGIST

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To be published as the first volume of its new "Memoirs Series" by the Pacific Coast Entomological Society on the occasion of its Semicentennial Anniversary, September, 1951.

Prepublication Price \$5.00

Regular Price \$6.00

Send orders to: Treasurer, Pacific Coast Entomological Society, California Academy of Sciences, San Francisco.

Entered as second class matter, February 10, 1925, at the post office at San Francisco, under act of August 24, 1912.

NEW HETEROMORPHOSES IN DROSOPHILA MELANOGASTER MEIG.

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INTRODUCTION

The classic example of heteromorphosis is the regeneration of antennulae after removal of an eyestalk in a number of Crustacea (Herbst 1895 seq.). Heteromorphosis thus is defined as replacement of an organ by another one of different morphology. In a general way such structures, whether they are produced by experimentation or occur spontaneously, whether they are hereditary (if known) or not, may be subdivided into the following major groups:

1. Morphoses which are more or less teratological variants of the organ in question, the latter still being recognizable in its general structure. Many mutants of *Drosophila* belong to this group e.g., aristaless (antennae), dachs (legs), and numerous teratological cases in many insects. [See for the latter the monograph by Cappe de Baillon (1927) and Bateson's classic work (1894); for *Drosophila* mutants, Bridges and Brehme (1944)].

2. Morphoses which constitute a complete departure from the organ they replace although the origin by transformation of this organ, or parts of it, is still visible. An extreme example of this is the hereditary replacement of the forelegs of *Drosophila* by a labium-like structure as described by Goldschmidt (1949), Goldschmidt, Hannah and Piternick (in press).

3. The so-called homoeotic changes in which a serial, segmental organ is replaced by another member of the series. Dorsal and ventral serial members are interchangeable. Many such forms are known from teratological literature. In the work on regeneration of a generation ago many cases of homoeotic regeneration have been described. In addition to the work of Herbst the most important contributions are those by Cuénot (1921), Przibram (1910-19), Brecher (1924) on regeneration of legs instead of antennae in different insects. But the best analyzed cases are the

homoeotic mutants of *Drosophila*, where the condition is hereditary, sometimes as a simple recessive or a simple dominant or based upon more than one locus. Because this important group of facts is not sufficiently known to morphologists, embryologists, and entomologists, the known cases may be recounted: a. Tetraptera (Tshetverikov, 1929), transformation of halteres into wings with a series of all intermediate morphological stages being available. b. Tetraltera (Goldschmidt, 1940); transformation of the wings into haltere-like structures, again with all intermediate stages existing. c. Podoptera (Goldschmidt, 1945; Goldschmidt, Hannah and Piternick, in press; Rapoport, 1942); transformation of the wings into incomplete legs, again with all transitions. A number of genetically different types are known. d. Aristapedia (Balkaschina, 1929); transformation of the arista into a tarsus, with many transitions. Many slightly different alleles known. e. Proboscipedia (Bridges and Dobzhansky, 1933); transformation of part of the proboscis into tarsi (or arista) with many transitions. f. Hexaptera (Herskovitz, 1949); presence of structures on the pronotum which may resemble perfect wings, halteres or legs or some transitional stage between them. g. Transformation of part of the eye into a palp-like structure (a number of different mutants, e.g., Glass (1949), Goldschmidt (1940), Valadares (1937)). h. The last addition (Piternick, not yet published), where the entire antenna is replaced by a complete leg.

Although in the cases just enumerated the heteromorphosis is hereditary, it is not always so. Some of the types can also be produced as non-hereditary "phenocopies" by environmental action (see Goldschmidt, 1938; Rapoport, 1947; Gloor, 1947). We know now (Goldschmidt, 1929, 1935 a.o.) that the phenotype of practically every morphological mutant known can also be produced experimentally as a non-hereditary phenocopy and one may safely predict that, vice versa, all non-hereditary variations, heteromorphoses or otherwise, which appear in experimentation or as freaks, may also occur as hereditary mutants. Mutant and phenocopy both indicate the possible range of variation in development still producing an organized whole, whether caused by environmental action or by a genetic change. They are identical in regard to morphogenesis, and thus both reveal the potentialities of the organism for morphological change. The primary importance of heteromorphoses, homoeotic mutants and phenocopies for an understanding of the genetic control of morphogenesis, and of variation, as well

as for evolution is obvious. Therefore a presentation of new facts means much more than an addition to a catalogue of teratological phenomena. Bateson (1894) had actually realized this in pre-Mendelian days, long before mutation, homoeotic mutation and phenocopy were known.

MINIATURE LEG IN GENITAL REGION

The first new example was found in a single male which was derived from a cross producing male intersexuality, the so-called Beaded-Minute-Intersexes. In one of these types the external genitalia of the male are completely absent (although portions thereof may be found internally; details in Goldschmidt, 1949) and therefore the ventral surface of the abdomen, frequently considerably enlarged, is very conspicuous. In the male in question a single tiny leg grew out of the combined 6th and 7th abdominal sternites. The leg was rather transparent and very small. It extended only over about half of the right side of the sternite to which it was attached. It did have a complete femur, tibia and tarsus, but hardly any hairs. It was oriented in the proper position of a right leg; a trochanter and coxa could not be seen. A simple sketch was made from the living specimen and it was demonstrated to my collaborator, Dr. L. K. Piternick. Then the specimen was preserved for detailed study after clearing. But in the vial the tiny leg disappeared, probably pulled off its socket by the motion of the liquid. Thus a more detailed description and drawing cannot be given.

A COMBINED WING HETEROMORPHOSIS

The second heteromorphosis is rather remarkable and especially interesting to the morphologist, embryologist and entomologist. It appeared also in a male from which no offspring was obtained so that it cannot be stated whether a mutant or a modification was present, which, as pointed out above, is not an essential point. The left wing was completely normal, while the right wing showed the heteromorphosis. It was very different from any of the variants found in podoptera and it is clear that it must have been developed in a completely different way. Actually it contained elements of wing, antenna and leg.

Figure 1 shows the structure from the right side. The dorsal contour line of the thorax is shown with only one of the bristles (dorsocentral) included for size reference. The contour of the scutellum is visible below. The basis of the left wing with that portion of the cubital cell not hidden behind the thorax, is outlined.

The heteromorphic wing is attached in the correct place but its attachment is by means of a tiny knob of dark chitin only. The entire structure is not more than about twice as long as the normal cubital cell and about the size of an antenna. Its supporting axial structure consists of a short attachment, two knobs and a long rod, not separated by joints, and made of hard dark chitin covered densely with spines. On the rod these spines are arranged in a row, similar to the arrangement of the spines at the anterior edge of the wing. But these spines are many times smaller than those of the normal wing. Where the second knob connects with the rod a small

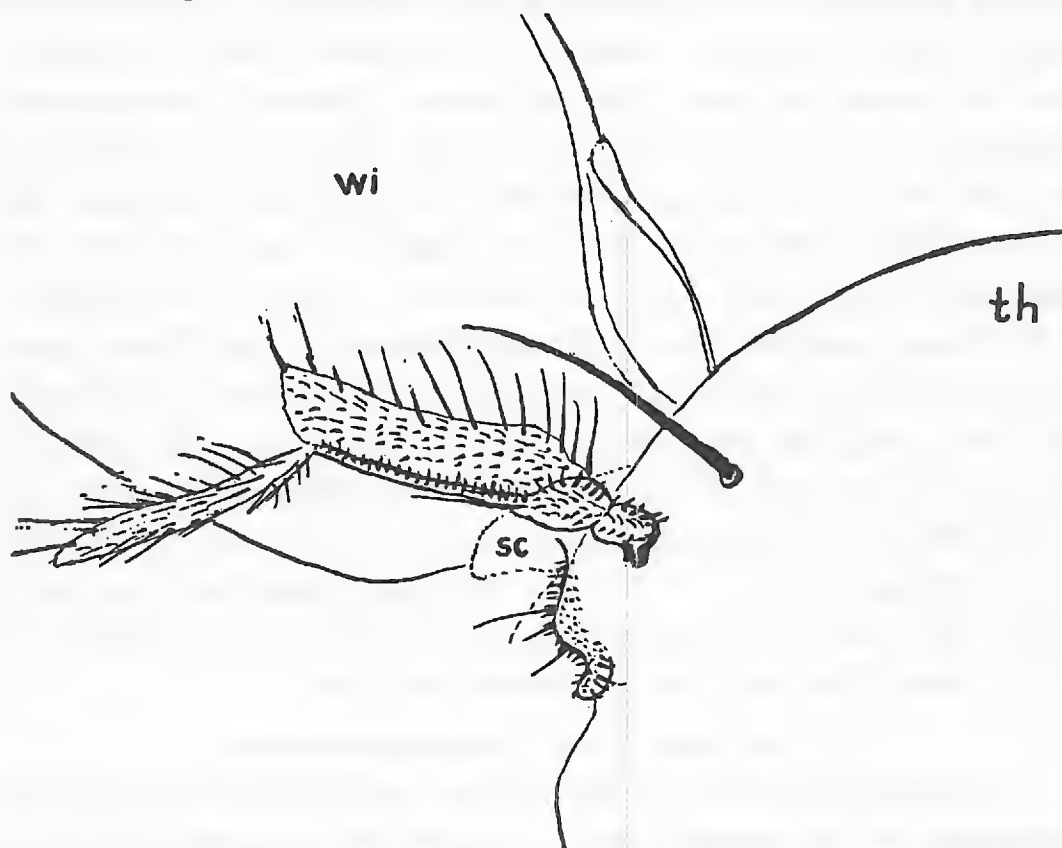


Fig. 1. A combined wing heteromorphosis in *Drosophila melanogaster*.

side-branch is visible which ends in a long stiff bristle. It stretches almost parallel to the rod, extending to one-half of its length. To the rod and second knob a rhomboid plate is attached covered with hairs (not all of them drawn) which are arranged like the hairs on the surface of the wing. The free edge is lined with long slender hairs, similar to the hairs upon the alula. In the position of the drawing this blade is pointing toward the body and the axis of the organ is in a lateral location. I assume that this topography has been distorted somewhat, inasmuch as the axis should be the anterior edge of the structure, with the blade behind it. At the end of the rod a part which looks very much like a foxtail is attached at

an angle. I suspect that this actually represents the continuation and end of the blade and was torn off partly during the eclosion from the pupal case. The spine-like process at the basis of the "fox-tail" fits exactly into the posterior end of the blade and has also the same structure, when viewed at higher magnification. The original topography would thus be obtained if the whole "tail" were moved out of the plane of the drawing, turning it 180° upwards around the point of attachment.

At the postero-lateral edge of the thorax behind this wing, a differentiation is found in form of a hairy double knob, as drawn. The probable meaning will be discussed below.

ANALYSIS

We ask now whether it is possible to relate the heteromorphic structure to known elements of the wing or another appendage. Actually it can be shown that wing, antenna, and leg elements are all present in the structure. In order to realize this we must remember some of the facts found in the podoptera wing (see Goldschmidt, 1945).

Here the transformation of the wing into a leg with all transitions between the two shows that the wing consists of four parts which behave more or less independently: 1. The costal vein and cell, which transform directly into the leg-like structure. 2. The anterior half of the wing blade, and 3. the posterior part of the blade which are both reduced in different ways down to typical chitinous knobs. 4. The alula (squama) which undergoes comparable changes independently. The heteromorphic wing discussed here is clearly not a variant of the podoptera wing which is always characterized by the typical transformation stages of the costal vein and cell, as illustrated in Goldschmidt, 1945.

In the present case a new type of transformation has taken place which involves only the two anterior sections of the wing. The costal vein and cell have been transformed into the two spiny knobs and their attachment, together representing a variant of the basis of an antenna with its three segments (see below). In the normal costal cell the vein ends with an incision of the wing margin—the point at which in podoptera the leg separates from the wing—and here two larger spines or spurs are located. This end of the costal vein is here transformed into the short process, which carries the long spine. Undoubtedly the long spine corresponds to one branch of an arista, while the process represents the attachment of the

arista to the basal segments. Beyond this point in a normal wing the wing edge is occupied by the marginal vein. It carries spines which are different in size, shape and arrangement from those of the costal vein along the costal cell. Actually this marginal vein is not a continuation of the costal vein but of the first longitudinal vein. (Details in Goldschmidt, 1945.) In the heteromorphic wing, part of this marginal vein is clearly represented by what was described above as the rod to which the wing blade is attached. The anterior section of the wing blade is thus represented by this rod-marginal vein and a rudimentary wing blade which has formed long hairs at its free margin and the "foxtail" at its tip. We shall see at once that the foxtail represents a transition from wing to tarsus, via arista. A completely new and in itself well organized organ, resembling more an antenna than a wing, has been formed.

Actually this comparison is more than only a formal one, as indicated above. If we remove the wing blade from this organ, a structure is obtained which resembles to a certain degree some conditions found in the mutant *aristapedia* (in which the basis of the antenna looks like the knobs in the present case, and the arista, instead of being transformed into a tarsus resembles somewhat our foxtail).

Figure 2, kindly contributed by Dr. Aloha Hannah, illustrates a new type of *aristapedia* mutant, found by her. In (a) an antenna is pictured with the three basal segments (scapus, pedicellus and funiculus) and the arista which is not so different from normal. (b) and (c) are more abnormal antennae of this mutant, none of them showing the perfect tarsus which is characteristic of typical *aristapedia*. In a general way the type resembles or is comparable to the heteromorphic wing structure without the blade. I may add that I have frequently seen abnormal *Drosophila* legs (in the mutant *podoptera*) in which the unsegmented tarsus was represented by a structure closely resembling the "foxtail."

There is one more remarkable point. Bridges (Bridges and Morgan, 1923) once found a mutant (since lost) called *Pointed wing*, in which the antennae were changed in the direction of a wing. The description given shows this mutant to be very similar to the present heteromorphosis. Thus, taking all these facts into consideration, I have no doubt that the heteromorphosis described here has the combined features of the two anterior sections of a wing, with simultaneous partial transformation into an antenna, and also

partial transformation into a tarsus. Thus it represents the most complicated heteromorphosis known in *Drosophila*, containing simultaneously elements of the change of a wing into an antenna, an antenna into a wing, an antenna into a tarsus, a wing into a tarsus. It illustrates the unbelievably complicated potentialities of a segmental disc and its ability to form in a single step what is to all purposes a completely new organ, perfect in itself, and as such no monstrosity at all.

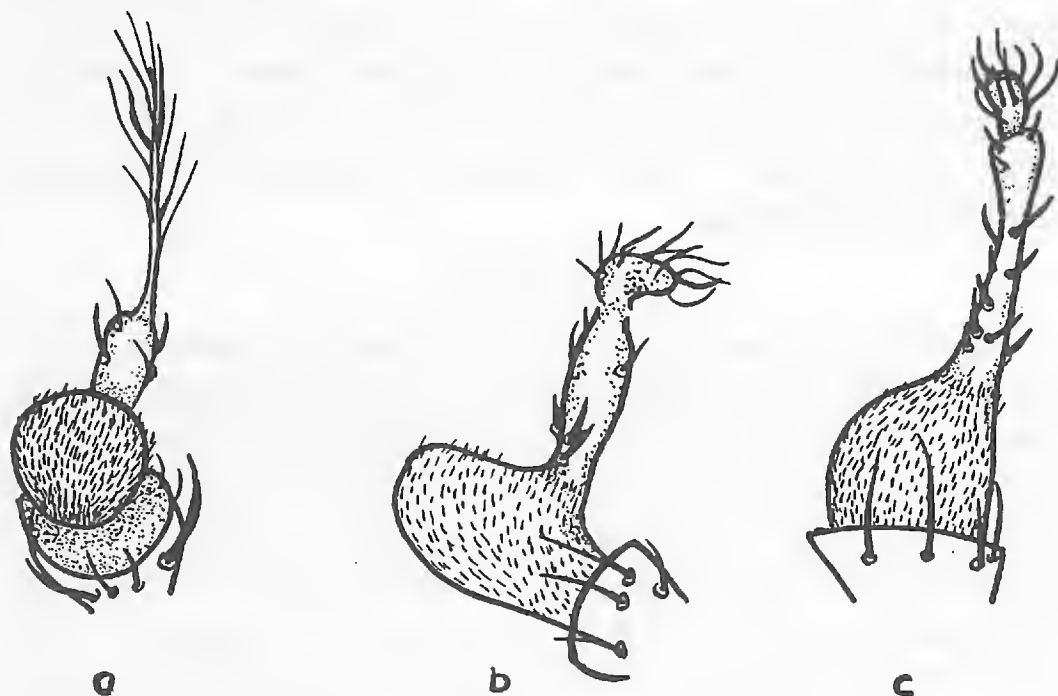


Fig. 2. A new type of aristapedia mutant in *Drosophila melanogaster*.

There is one more point which is of special interest to the entomologist. In an earlier paper (1945) I discussed the fact that the transformations of the podoptera wing show, in partial confirmation of Berlese's views, that the wing consists of four integrated parts, which may become separated. I discussed his views, also the fact that the four sections which are revealed in the podoptera mutant do not agree completely with Berlese's definition (see table 6, p. 92 in Goldschmidt, 1945). Berlese assumed the first section to be precostal and represented by a tegulum, where it exists; his second section comprised most of the wing blade. My first section was the costal cell and the second the anterior half of the wing blade. Since then a number of podoptera flies have been found which have a precostal appendage of the mesothorax. Description and illustrations will be found in a forthcoming paper by Goldschmidt, Hannah and Piternick. Thus my former evaluation of Berlese's scheme should be revised so as to have Berlese's precostal element as the first and to add the costal section, which forms the leg in podoptera,

as the second section. Third and fourth would then be the two sections of the wing blade, as described in the former paper, and the fifth is the alula or squama.

Returning once more to the heteromorphosis of Figure 1, we find it to contain only section two and part of section three of the wing; sections four and five are not represented. In podoptera the sections which have become rudimentary are frequently represented by chitinous knobs of varying structure as described in the earlier paper. This fact now permits an interpretation of the structure located behind the heteromorphic wing and drawn in Figure 1. It is clearly the rudiment of the posterior two sections of the wing (anal part and alula), smaller and more reduced than the knobs found in podoptera flies.

DISCUSSION

It would be interesting to discuss the morphogenetic and evolutionary significance of all the foregoing facts. Discussions of some of the problems involved are found in Goldschmidt (1945) and in Goldschmidt, Hannah and Piternick (in press). An exhaustive discussion would require presentation and analysis of all the facts of heteromorphosis and of the experimental work done in the field, and would also have to include the problem of homology. Therefore it will be reserved for a future occasion. But it may be of help to others interested in the subject and not at home in genetical literature if we recount in a comparative way the heteromorphic replacements known thus far, and the complete or partial transformations of segmental appendages known in *Drosophila*.

1. The arista of the antenna may be replaced by a complete tarsus or by all transitions between arista and tarsus (aristapedia mutant and alleles).

2. The entire antenna may be replaced by a complete leg in which it seems that the scapus of the antenna forms the trochanter, the pedicellus the femur, the funiculus the tibia, and the arista the tarsus. (Details not yet worked out.)

3. The antenna may transform into an anterior wing margin to which a little wing blade, supposedly the anterior section, is attached (mutant Pointed wing).

4. The wing may, as a whole, be transformed into a haltere through all transitional stages (mutant tetraltera).

5. This haltere may be transformed into a leg without a tarsus (the same).

6. The haltere may be transformed through all transitions into a wing (mutant tetraptera).

7. Segments normally without appendages may grow legs (present first case) or legs, wings, halteres and combinations (mutant hexaptera).

8. The costal cell of the wing may be transformed into a leg without tarsus (mutant podoptera).

9. The precostal wing elements (tegula) may appear, where not normally present, in the form of palp-like structures (mutant podoptera).

10. The three postcostal parts of the wing may be independently reduced to palpi or knobs (mutant podoptera).

11. The costa of the wing may be transformed into the basic antenna segments (present case).

12. The marginal part of the wing edge may form a structure corresponding to an arista and also to a tarsus (present case).

13. Oral lobes of the proboscis may be changed into an arista or a tarsus (mutant proboscipedia).

Important experimental-embryological work has been done with the mutant aristapedia by Braun (1940), Villee (1943-45), Waddington (1939), and Vogt (1946). Its bearing on some of the problems of homoeosis is being discussed in the forthcoming paper by Goldschmidt, Hannah and Piternick.

BIBLIOGRAPHY

BALKASCHINA, E. I.

1929. Ein Fall der Erbhomoösis (die Geno-variation aristapedia) bei *Drosophila melanogaster*. Roux Arch. 115:448-463.

BATESON, W.

1894. Materials for the study of variation. London, Macmillan. XV, 598 pp.

BRAUN, W.

1940. Experimental evidence on the production of the mutant aristapedia by a change of developmental velocities. Genetics 24:143-149.

BRECHER, L.

1924. Die Bedingungen für Fühlerfüsse bei *Dixippus*. Arch. Entwicklmech. 102:549-572.

BRIDGES, C.F. and K. BREHME

1944. The mutants of *Drosophila melanogaster* Carnegie Inst. Publ. 552, 252 pp.

BRIDGES, C.F. and TH. DOBZHANSKY

1933. The mutant proboscipedia in *Drosophila melanogaster*, a case of hereditary homöösis. Arch. Entwicklmech. 127:575-590.

BRIDGES, C. F. and TH. H. MORGAN

1923. The third chromosome group of mutant characters of *Drosophila melanogaster*. Carnegie Inst. Publ. 327:1-250.

CAPPE DE BAILLON, P.

1927. Recherches sur la tératologie des insectes. Encycl. entomol. S. a. No. 8, 291 pp.

CUENOT, G.

1921. Régénération des pattes a la place d'antennes sectionnées chez un Phasme. C. R. Ac. Sc. Paris 172.

GLASS, B.

1949. The distribution of erupt + suppressor-erupt in *Drosophila melanogaster* and *D. simulans*. Proc. Intern. Congr. Genet. Hereditas Suppl. 582-583.

GLOOR, H.

1947. Phaenokopieversuche mit Aether an *Drosophila*. Rev. Suisse Zool. 54:637-712.

GOLDSCHMIDT, R. B.

1929. Experimentelle Mutation und das Problem der sogenannten Parallelinduction. Biol. Centralbl. 49:437-448.

1935. Gen und Ausseneigenschaft I. II. Ztschr. ind. Abstl. 69:38-69, 70-131.

1938. Physiological Genetics. McGraw-Hill, 338 pp.

1940. The Material Basis of Evolution. Yale Univ. Press. 436 pp.

1945. The structure of podoptera, a homoeotic mutant of *Drosophila melanogaster*. J. Morph. 77:71-103.

1949. The Beaded Minute-intersexes in *Drosophila melanogaster* Meig. J. Exp. Zool. 112:233-302.

GOLDSCHMIDT, R. B., A. HANNAH and L. K. PITERNICK.

(In press.) The podoptera effect in *Drosophila melanogaster*. Univ. Calif. Publ. Zool.

HERBST, C.

1895-1916. Regeneration von antennenähnlichen Organen an Stelle von Augen. I-VII Arch. Entwicklgsmech. 2, 9, 13, 30, 42.

HERSKOVITZ, I.

1949. Hexaptera, a homoeotic mutant in *Drosophila melanogaster*. Genetics 34:10-25.

PRZIBRAM, H.

1910-19. Homoeosis bei Arthropoden I-VIII Arch. Entwicklgsmech. 29, 43, 45.

RAPOPORT, T. A.

1942. Genetic analysis of dependent differentiation in the embryogeny of Diptera. Bull. Ac. Sc. U.S.S.R. 4:254-284.

1947. On the synthesis of gene products in equimolecular quantities. Amer. Nat. 81:30-37.

TSHETVERIKOV, S. S.

Published in Astauroff, B. L. (1929): Studien über die erbliche Veränderung der Halteren bei *Drosophila melanogaster* Meig. Roux Arch. 115:424-447.

VALADARES, M.

1937. Déclanchement d'une haute mutabilité dans une lignée de *Drosophila*. *Revista Agrar.* 25:363-383.

VILLEE, Cl. A.

1943-45. Phenogenetic studies of the homoeotic mutants of *Drosophila melanogaster* I. J. exp. Zool. 75-98, II 96:85-102, III. *Am. Natur.* 79:246-258.

VOGT, M.

1946. Zur labilen Determination der Imaginalscheiben von *Drosophila*. II. Die Umwandlung presumptiven Fühlergewebes in Beingewebe, *Biol. Zbl.* 65:238-254.

WADDINGTON, C. H.

1939. Genes as evocators. *Growth Suppl.* V. 1:37-44.

FOUR NEW MOSQUITO RECORDS FROM UTAH (Diptera: Culicidae)

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In October, 1934, April, 1942 and January, 1944, the available mosquito records for Utah were published by the senior author in this Journal. The following constitutes four new species records for Utah which extend to thirty-six the species reported as occurring in the state.

The writers are indebted to the University of Utah Research Committee for granting funds to aid in conducting further investigations of the mosquito fauna of the mountains of Utah. The two new *Aedes* records reported herein were obtained as a result of this study.

Unless otherwise indicated the collections were made by the writers.

AEDES IMPIGER (Walker)

This species is fairly common in northern Utah at elevations ranging from 6,000 to 9,000 feet. It has been taken only in areas along mountain streams and chiefly in or near willow growths. It is a one-brooded species, the larvae appearing in April, May and early June depending upon the elevation. It is an annoying pest in some localities, but persists for only a short time. No females have been collected in Utah after the first of July.

Salt Lake County: Giles Flats, Big Cottonwood Canyon, May 7, 1949; Brighton, June 13, 1948. Summit County: Lemon's Grove, Provo River, May 1, 1948; Park City, April 24, 1949; Smith and Morehouse Reservoir, May 28, 1949; Soapstone Ranger Station, Provo River, April 23, 1947. Wasatch County: Jordenelle, Provo River, April 16, 1949; Stewart's Ranch, Provo River, May 1, 1948.

AEDES NEARCTICUS Dyar

This mosquito has been collected in only one locality in Utah. Larvae and adults were found in an alpine meadow at an elevation of 10,100 feet in the Uintah Mountains. This is a true arctic species and although rare in Utah, is probably found throughout the Uintah Mountain Range wherever suitable alpine conditions occur. Because of its restricted distribution it is not of pest importance in Utah.

Summit County: Wall Lake, Uintah Mountains, July 5, 1947 (E. J. Roscoe), July 12, 1947.

CULEX APICALIS Adams

This species is represented by a single larval specimen taken at Kamas, Utah, at an elevation of 6,400 feet. It is probably more widely distributed in Utah than this single record would indicate.

Summit County: Kamas, July 4, 1948 (F. C. Harmston).

CULEX QUINQUEFASCIATUS Say

Males of this species were found by the writers amongst unidentified material in the University of Utah collection. Only two localities are recorded but as they represent both northern and southern areas of the state it is likely that the species is distributed throughout Utah in the lower valleys at elevations below 5,000 feet.

Salt Lake County: September 24, 1940, September 10, 1943.

Washington County: St. George, October, 1938.

LITERATURE CITED

REES, DON M.

1934. Mosquito records from Utah. *Pan-Pac. Ent.*, 10:161-165.

1942. Supplementary list of mosquito records from Utah. *Pan-Pac. Ent.*, 18:77-82.

1943. The mosquitoes of Utah. *Bull. Univ. of Utah*. Vol. 33, No. 7.

1944. A new mosquito record from Utah. *Pan-Pac. Ent.*, 20:19.

DETERMINATION OF SEX IN ADULT RICE AND GRANARY WEEVILS

(Coleoptera: Curculionidae)

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The rice weevil, *Sitophilus oryzae* (L.) and the granary weevil, *S. granarius* (L.) are the most important destructive members of the genus *Sitophilus*. These insects are very small and resemble each other in general form and biology, but can be easily distinguished from one another. In contrast to the granary weevil, the rice weevil is smaller, has four rufous spots on the elytra, possesses functional wings and the punctuations on the body are circular instead of oblong.

Although the species can be easily distinguished, the separation of the sexes based upon external morphological characters offers a more difficult problem. Therefore, an investigation was conducted to determine what characters might be useful in separating the sexes. Male and female weevils of both species, about two months old, were secured from a mass culture maintained at room conditions. Adults were etherized before they were measured. The body length (prothorax and abdomen) and the width of the rostrum (middle part) were measured in dorsal aspect. The length of the rostrum, including the base of the eyes to the tip of the mandibles, was measured in lateral aspect. It should be mentioned here that it is very important to make measurements in the same aspect for each part in each individual. In making measurements a binocular microscope equipped with an eye piece micrometer was used. More than 50 individuals of each sex of each species were measured. The characters on the rostrum can be easily seen when the weevil is held dorsally on the forefinger with the thumb covering the abdomen and thorax and then placing it under a binocular of high magnification in the presence of bright light.

It was found that the body length was of no value in determining the sexes. It was also observed that the age and size of the weevils influenced the size of the rostrum, but this influence became very insignificant as adults reached maturity. The useful characters in separating the sexes, however, were found to be present in the rostrum and the tip of the abdomen.

The male rostrum is comparatively shorter and wider as compared to the narrower, longer and more cylindrical rostrum of the female. In this regard Birch (1944) observed that the rostrum of the male rice weevil was shorter and thicker. Also, in the male the dorsal surface of the rostrum is closely and strongly punctured whereas in the female the punctures are superficial and sparse and rarely occur on the distal end. Richards (1947) separated the male rice weevil from the female on the basis of punctures on the rostrum. These distinguishing differences between the sexes are shown in figure 1. It should be pointed out here that the difference in the density of punctures on the rostrum of male and female granary weevils is not so well marked as is in case of rice weevils. With some practice, however, the female granary weevil can be easily distinguished from the male by the presence of a more slender and cylindrical rostrum.

TABLE 1

Measurements of rostri of male and female rice and granary weevils.

Species	Sex	Length of the rostrum in mm.		Width of the rostrum in mm.		Ratio of width of the rostrum to the length of the rostrum	Ratio of lengths of male rostrum to female rostrum	Ratio of widths of male rostrum to female rostrum
		Range	Average	Range	Average			
Rice weevil	Male	0.785- 1.075	0.893	0.161- 0.200	0.179	1.0 : 5.0	1.0 : 1.2	1.2 : 1.0
	Female	0.856- 1.200	1.036	0.133- 0.163	0.147	1.0 : 6.9		
Granary weevil	Male	0.875- 1.250	1.063	0.175- 0.225	0.207	1.0 : 5.1	1.0 : 1.4	1.6 : 1.0
	Female	0.963- 1.330	1.176	0.150- 0.187	0.169	1.0 : 6.9		

A clear picture of the relation between sizes of rostri of male and female weevils can be obtained from table 1. In both species the male rostrum is shorter and wider than that of the female. It is also seen from the table that in the male and the female the ratio between the width and the length of the rostrum is approximately the same in each species. The ratio between lengths or widths of male and female rostri, however, is not equal and varies slightly in each species. In the female the range of variation in the width of the rostrum is less than is that in the male although the variation in the length of the rostri is equally great in both sexes.

In addition to the above characters the male rostrum is much less curved than is that of the female. This is most apparent when individuals are viewed from the side. Also when seen from the

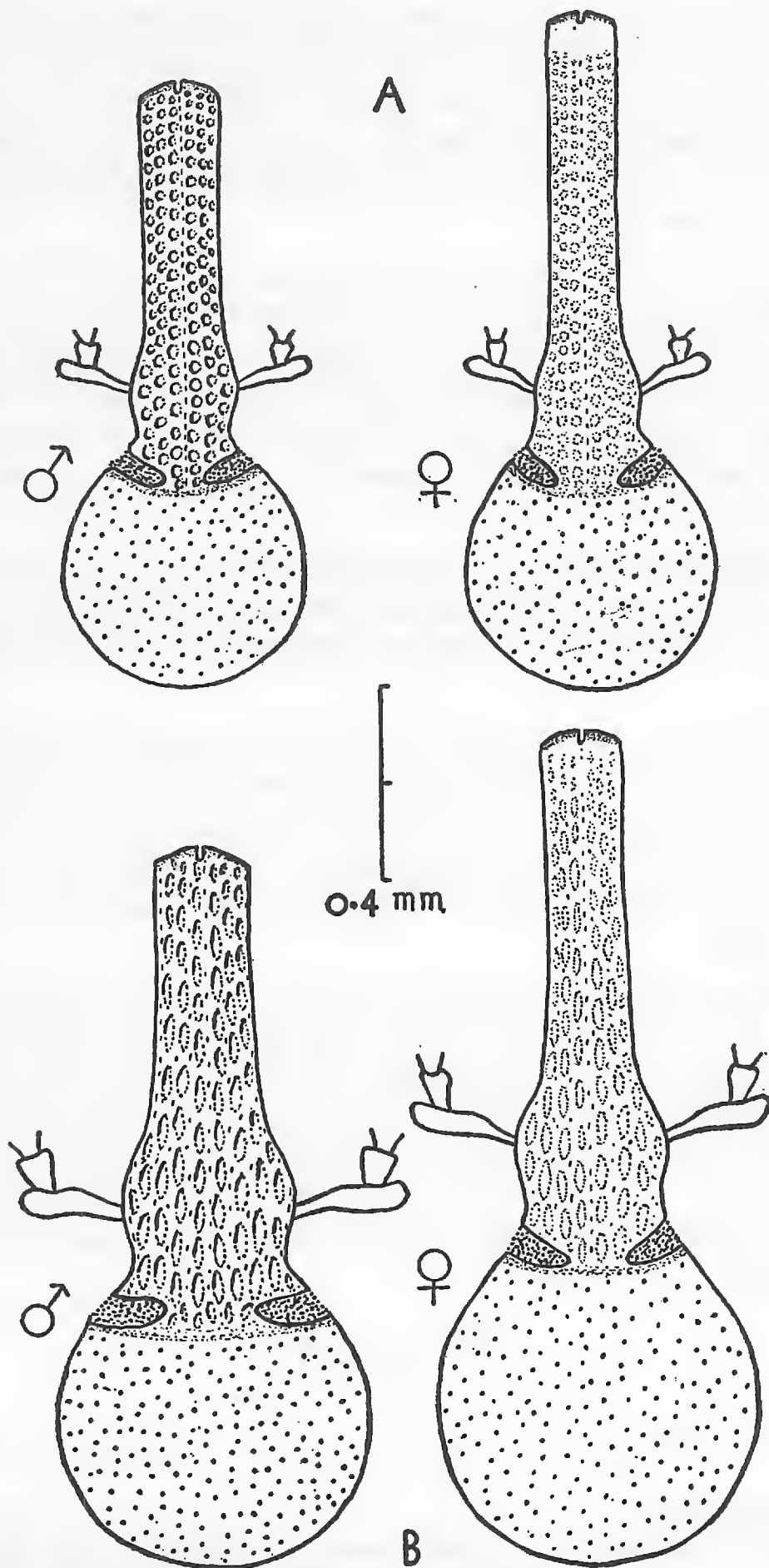


Fig. 1. Rostri of male and female weevils. A, the rice weevil *Sitophilus oryzae* (L.) ; B, the granary weevil, *S. granarius* (L.).

dorsal aspect the male rostrum is slightly narrower in the center and wider at the ends than is that of the female. The female rostrum, particularly the anterior part, when viewed under a strong light appears brighter. This is especially true in the case of the rice weevil where the rostrum is lightly punctured, the distal end being almost devoid of punctures.

Although not as suitable as the characters given for the rostrum, the shape of the last abdominal sternite can be used to separate the two sexes. Richards (1947) used this character to distinguish male and female granary weevils. He found that in the male the sternite is more ventrally flexed than in the female. While this character is not so pronounced in the rice weevil it can be used in separating the sexes.

Hundreds of adults of both species which were sexed on the basis of characters of the rostrum mentioned above were dissected to verify the sex and in all cases examined, these characters held true.

Summary:—In both the rice weevil and the granary weevil the male rostrum is comparatively shorter and wider and its dorsal surface is closely and strongly punctured as compared to the female rostrum which is longer, thinner and more cylindrical in form, the punctures being superficial and sparse, rarely occurring on the distal end.

Acknowledgments:—I wish to express my deepest gratitude to Dr. A. E. Michelbacher for reading the manuscript, making helpful suggestions and for guiding the work during the investigation. Acknowledgments are made to professors E. O. Essig and E. G. Linsley for help and suggestions, and to the former for providing the facilities. The valuable help of Miss M. Moeller and the suggestions of Mrs. F. Abernathy in making drawings are sincerely appreciated.

LITERATURE CITED

BIRCH, L. C.

1944. Two strains of *Calandra oryzae* L. (Coleoptera). Australian Jour. Expt. Biol. and Med. Sci., 22:271-276.

RICHARDS, O. W.

1947. Observations on grain weevils, *Calandra* (Col., Curculionidae). 1. General biology and oviposition. Proc. Zool. Soc., 17 (1):1-43.

HISPELLA A SYNONYM OF HISPA LINNAEUS, AND A NEW DACTYLISPA FROM CHINA

(Coleoptera: Chrysomelidae)

H. S. BARBER¹

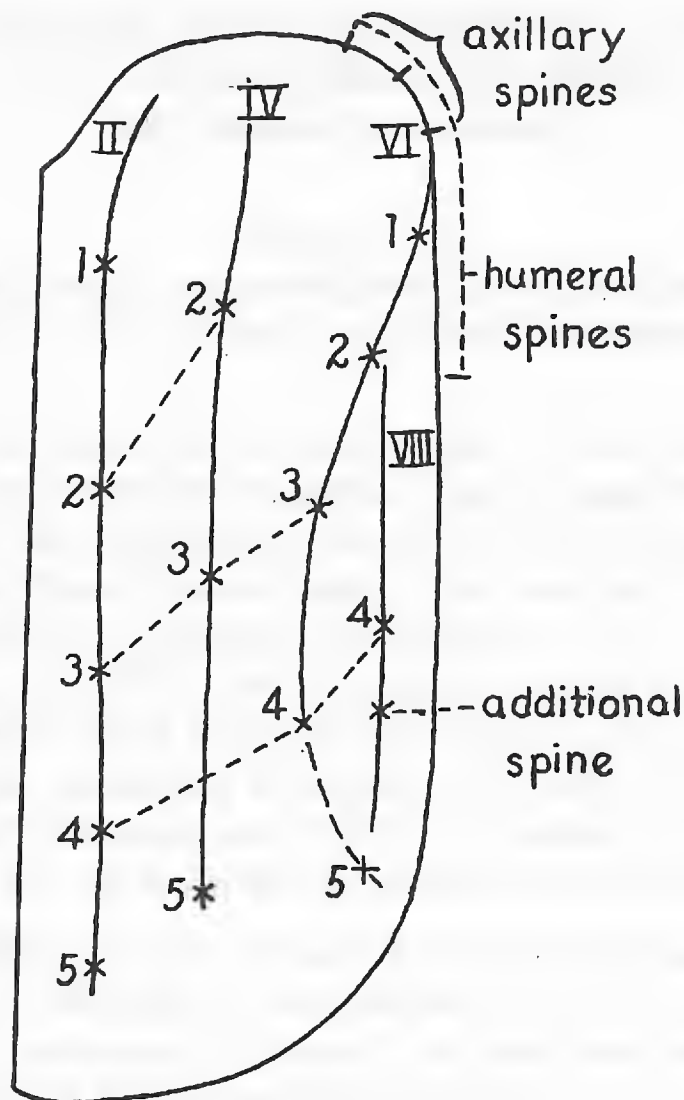
*Bureau of Entomology and Plant Quarantine, Agricultural Research
Administration, United States Department of Agriculture*

This note records comparisons recently made by Dr. Erich Uhmann (Stollberg, Saxony, Germany) of types of two described species of spiny Hispinae of the genus *Dactylispa*, with a new species from China. This new form, below named *Dactylispa luhi*, was reared by C. J. Luh of the National Tsing Hua University, Peiping, China, from a grass, *Arthraxon hispidus* (Thbg.), a variety of which now occurs in 10 or more States in North America. It also seems proper at this time to object to the misuse of the generic name *Hispa* by Chapuis in 1875, whose error has been followed unquestioned by his successors for three-quarters of a century.

Hispa Linnaeus 1767 (Syst. Nat. vol. 1, pt. 2, p. 603) included four species, of which the fourth is now catalogued in the Colydiidae, the third was placed in *Paussus* by Schoenherr, 1817 (Syn. Ins., vol. 3, p. 19), while the first two remain in the subfamily Hispinae. Latreille, 1810 (Consid. Gen., p. 432), designated (fide Opinions 11 & 136) the type of *Hispa* as *Hispa atra* Fab., and since Fabricius cites Linnaeus' original description the record automatically falls upon Linnaeus' first species, which was also cited as the genotype by Kirby, 1837 (in Richardson, Fauna Boreali-Americana, p. 227) and by Westwood, 1838 (Introduct. Modern Class. Insects, vol. 2, Synopsis, p. 42). The date of the part last cited is often erroneously given as 1840.

These type designations were ignored by Chapuis, 1875 (in Lacordaire, Hist. Nat. Ins., Gen. Coleop., vol. 11, p. 334). He erroneously cited *Hispa testacea* as type of *Hispa* and proposed a new generic name, *Hispella*, citing as its type *H. atra* L., which is the previously designated type of *Hispa* L. Thus *Hispella* Chap. is an isogenotypic synonym of *Hispa* L., and we must find a different name for the group which has been miscalled *Hispa* for about 75 years.

¹Mr. Barber died on June 1, 1950.



Dactylispa luhi Uhmann

Although subdivision of old genera now seems prevalent, re-studies of adequate material often lead to synonymy of names proposed for supposedly distinct groups. If *Thoracispa* Chapuis, 1875 (l.c. p. 335), type *T. dregei* Chp., 1875 (validated by his remarks on p. 336 but dated by Weise, 1911, in Junk Cat., pt. 35, p. 74, as from its second description in 1877), were to remain in the group called *Hispa* by Weise, that name should be adopted. But since Dr. Uhmann tells me *Thoracispa* must be regarded as generically distinct, the choice of a name to supplant *Hispa* Chapuis, Weise, and others would fall on *Dicladispa* Gestro, 1897, with *Hispa aenescens* Baly, 1887, as its type (this latter specific name is regarded as a synonym of *Hispa armigera* Olivier, 1808).

Dr. Uhmann's notes and illustration are adopted in the following description.

Dactylispa luhi Uhmann, new species

Similar to *D. assamensis* Weise but narrower, with slenderer antennae when examined from either their broad, or their narrow sides. In the latter aspect (dorsal) segment 3 is longer than in *assamensis*; 4 and 5 are longer than broad; 6 is not broader than long, 7 is longer than broad. In their broader (lateral) aspect segments 3, 4, 5 are distinctly longer than broad and without visible longitudinal channels while in *assamensis* all segments except 3 and 11 are broader than long and 3 to 6 are distinctly longitudinally sulcate. Prothoracic spines more slender but placed as in *assamensis*. Elytral spines in oblique series (see figure): interstice II with spines 1-5; IV 1 is lacking, IV 2 far forward, only a little posterior to II 1; IV 3 and IV 5 also much forward of II 3 and II 5; IV 4 lacking; humerus with 5 spines as in *assamensis*, VI 1, VI 2, behind the three axillary or prehumeral spines, VI 3 and VI 4, closer to the suture and VIII 4, VIII 5 close to the margin with an additional spine between them which is not present on *assamensis*. Length, 3.1 mm.

This species, *luhi*, differs greatly from the lectotype of *D. pusilla* Weise; the antennae are much more slender, the thoracic and elytral spines are slenderer and longer.

Holotype, U. S. National Museum, cat. no. 59393.

Reared by C. J. Luh of Peiping, China, from *Arthraxon hispidus* (Thbg.) under his experiment number 3561, but the type locality was not stated by him. He was near Kunming, Yunnan, in Southwestern China during the war.

A HOMONYM IN THE GENUS THRIPS LINNÉ

(Thysanoptera: Thripidae)

About ten years ago a case of homonymy was noted in *Thrips setosus* Moulton, 1929. At this time Mr. Moulton's attention was called to the condition but it appears not to have been corrected. *Thrips setosus* Moulton, 1928 (Annotationes Zoologicae Japonenses 11(4):304-305. Dec. 20) has priority over *Thrips setosus* Moulton, 1929 (Records of the Indian Museum 31(2):97-98. July). *Thrips setosus* Moulton, 1928, was described from Osaka, Japan, and the type is in the Moulton collection (No. 2358). For the homonym, *Thrips setosus* Moulton, 1929, nec *setosus* Moulton, 1928, I propose herewith the name *temporatus*. The unique type of *temporatus* Bailey, *nom. nov.* (Moulton No. 2002) is in the Indian Museum, Calcutta.—Stanley F. Bailey, Davis, California.

OBSERVATIONS ON RHOPALOMYIA CALIFORNICA FELT
(Diptera: Itonididae)

J. W. TILDEN

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GALLS: This species forms many-chambered galls on the plant terminals; a few single-chambered galls on the leaves seem also to be made by it. The host is chaparral broom (*Baccharis pilularis* D. C.), both the prostrate coastal subspecies *typica* C. B. Wolf, and the erect inland subspecies *consanguinea* D. C.

Sectioned and stained galls show a matrix of parenchyma-type cells that forms the mass of the gall. The larval chambers are tubular, closed distally and of mechanical tissue. This tissue is absent distally and apparently also inwardly, though this is less certain.

Cross sections show numerous small vascular bundles, the apparent medium of food and water exchange for the gall. These bundles appear to be those of the petioles and veins of the undeveloped leaves that are involved in the gall. This conclusion is based on two considerations: first, that the bundles are concentrically arranged as in the bud, and second, that the xylem is internal and the phloem external as in the petioles of normal leaves.

The epidermis of the gall is composed of from one to three, usually two, layers of cells. The larval chambers are closed distally by a few layers of cells. No open chambers with developing larvae were found.

EGGS: Eggs are laid on the terminals, usually on the buds. The newly hatched larvae enter between the bud scales, by pushing in between the unopened leaves. No gall is formed until after the larvae enter, so it is concluded that the stimulus for gall formation is the entry of the larvae and not oviposition. Oviposition is largely external, and apparently eggs are not inserted into the tissue, although they may be placed under partly opened leaves.

LARVAE: Minute larvae may crawl for some distances, apparently at random. By no means do all of the young larvae gain entry; many wander until they die. Oviposition is profuse but galls are relatively few-chambered. The mortality rate of young larvae is high; only a few become established. The communal galls seem to be a random result, caused by the entry of several larvae into one bud. The gall that is stimulated by this mass entry eventually en-

velopes all the larvae in any given bud. The concentric arrangement of the chambers of the gall seems to evolve from the concentric arrangement of the bud leaves.

Since the galls are closed, the suggestion is made that the larvae obtain oxygen through or from the tissues of the plant. Superficial tissues of the galls are rich in chloroplasts, and a possible explanation (by no means proven) is that the oxygen that results from photosynthesis may enter the larval chambers. Further plausibility is furnished by the fact that the cells closing the galls are photosynthetic.

Larvae face the inner end of the chamber. The method of obtaining nourishment is not clear. The mechanical structure of the gall and the structure of the larvae suggests that food is liquid in nature. Observations begun by another observer to clear up this point have not to date led to any conclusion.

Prior to pupation, the larva turns in the cell and faces outward. This was not observed in fact, but since the developing larvae face inward while the pupae face outward, such a turning must occur. Because of the opacity of the galls, and their tendency to wither, no accurate information was obtained as to number of larval instars and length of pupal period, but indications are that the instars are few and the pupal period short.

PUPAE: The pupa is equipped with a cephalic projection which serves to push through the cells that close the chamber. The pupa appears at the outer end of the cell and gradually protrudes. Protrusion continues until but a few abdominal segments remain in the cell. Then the pupal skin splits irregularly and the adult emerges. Emergence is at first without evident movement, the adult slowly squeezing out by translocation of body fluids, by ingestion of air, or by both. When the adult is far enough out to free any appendages, these are moved slowly and soon become functional. Frequently adults crawl onto the gall to sit while their tissues harden. Emergence takes but a few minutes. The pupal skin remains hanging to the gall.

ADULTS: Newly emerged adults mate almost at once. Mating is brief. Males are short lived. In a typical instance, mating occurred at 9:00 A. M. and the male died at 12:20 P. M. This male had

emerged at 8:00 A. M. and so had an adult life span of four hours and twenty minutes.

Newly emerged females are distended with eggs. The vermillion colored eggs give the abdomen of the female an orange color. After oviposition, the female is slender in form and dusky in color. Oviposition is rapid and begins soon after mating. While eggs are mostly laid on the tips, some may be laid at some distance down the stems. In nine instances, the average number of eggs was 146, but in each case unlaid eggs remained. Dissections of three females just prior to egg laying showed an average of 279 eggs in the abdomens. It would appear that this maximum number is seldom laid. This tendency not to lay all of the eggs that are developed appears to be common to many species of insects of diverse orders.

The gut of adults of this fly is greatly reduced and appears to be non-functional. None was seen to pass any excrement.

The life span of the female exceeds that of the male, the longest survival time observed being fifty-two hours. The mouthparts seem to perform no function; none was observed to take either food or water.

PARASITES: This fly is heavily parasitized. The following parasites were reared: *Torymus baccharidis* (Huber); *Amblymerus* n. sp., *Eupelmus inyoensis* Girault *Eupelmus* sp., *Tetrastichus* sp., *Platygaster* sp. Some of these are undoubtedly secondary, but their exact status is at present not known.

ACKNOWLEDGMENT: Mr. C. F. W. Muesebeck of the United States National Museum was so kind as to identify the parasites.

LEPIDOPTERISTS' SOCIETY

It is with great interest that we note the organization of the Lepidopterists' Society. Installed as officers were J. H. McDunnough as president, A. H. Clark as senior vice-president, J. B. Ziegler as treasurer, and F. H. Rindge as secretary. The society held its first annual meeting in New York on December 29th and 30th and certain aspects of the meeting have been reviewed in the New Yorker magazine for January 13, 1951. Those interested in membership or in additional information should address their communications to Dr. F. H. Rindge, Department of Insects & Spiders, American Museum of Natural History, Central Park West at 79th Street, New York 24.—PAUL D. HURD, JR.

A CHECK LIST OF THE TICKS OF UTAH

LAFE R. EDMUNDS*

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This paper provides a distributional list of the ticks of Utah, with their hosts. Approximately 650 specimens of ticks have been examined from Utah comprising representatives of 19 of the 21 species listed. Specimens of *Ornithodoros eremicus* Cooley and Kohls^{5†} and *Ixodes diversifossus* Neumann, Stanford¹², previously reported from Utah, were not available for this study.

The writer is indebted to Glen M. Kohls of the U. S. Public Health Service, Rocky Mountain Laboratory, Hamilton, Montana, for verification of identifications; also to F. C. Bishopp of the Bureau of Entomology and Plant Quarantine for his assistance in obtaining literature and further references, and to Don M. Rees of the University of Utah for guidance and aid during this study. The study was made possible by a research grant from the University of Utah Research Committee.

In this report the collection records are arranged alphabetically by county. Unless otherwise indicated, all records listed as new are of specimens now in the collection of the University of Utah. In the lists of specimens examined, abbreviations are employed as follows: (U.S.A.C.) Utah State Agricultural College; (R.M.L.) Rocky Mountain Laboratory; (U.S.P.H.S.P.L.) United States Public Health Service Plague Laboratory.

1. *Argas reflexus* (Fabricius).—NEW RECORDS: Uintah County, 3 mi. S. Vernal, July 27, 1948, cliff swallows (C. Greenhall). These specimens were immature forms, and were labeled "probably *reflexus*" at the R.M.L.

2. *Argas persicus* (Oken).—RECORDS FROM LITERATURE: Tooele County, Tooele, Apr. 18, 1934, chickens (G. F. Knowlton), Bishopp and Trembley²; Washington County, "near" St. George, 1936, chickens (E. W. Davis), Cooley and Kohls⁷.—NEW RECORDS: Kane County, 5 mi. NW. Kanab, May 18, 1947, long tailed chat (J. C. Downey); Salt Lake County, 3 mi. E. Salt Lake City, 1948, fox sparrow (R. Selander).

3. *Otobius megnini* (Duges).—RECORDS FROM LITERATURE: The following authors list this tick as occurring in Utah without giving specific collection data: Hunter and Bishopp¹⁰, Bishopp and Trembley², Cooley and Kohls.⁷ NEW RECORDS: Emery County, San Rafael

*Contribution from the Division of Biology, Department of Invertebrate Zoology and Entomology, University of Utah, Salt Lake City, Utah.

†The collection records from the literature are followed by the author's name and a number, referring to the number of the reference in the bibliography. The names placed in parentheses are those of the collectors of the specimens.

Desert, Aug. 16, 1947, calf (B. Moore); San Juan County, Dry Mesa, Oct. 27, 1946, deer (J. Berryman); Sanpete County, Wales, Oct. 19, 1946, deer (D. M. Rees); Washington County, Beaver Dam Wash, May 6, 1941, host unknown (J. Berryman).

4. *Ornithodoros eremicus* Cooley and Kohls.—RECORDS FROM LITERATURE: San Juan County, "near" Bluff, Aug. 24, 1939, *Peromyscus maniculatus*, Cooley and Kohls.⁵

5. *Ornithodoros turicata* (Duges).—RECORDS FROM LITERATURE: San Juan County, "near" Monticello, Aug. 31, 1940, burrow of *Citellus* sp. (R.M.L.), Cooley and Kohls⁷; Washington County, Beaver Dam Slope, 1939, *Gopherus agassizi*, Woodbury and Hardy.¹³

6. *Ornithodoros parkeri* (Cooley).—RECORDS FROM LITERATURE: Collections from Carbon, Emery, Grand, Iron, Uintah, and San Juan Counties reported by Davis.⁹ NEW RECORDS: Washington County, Beaver Dam Slope, Sept., 1939, tortoises (A. M. Woodbury).

7. *Ornithodoros kelleyi* Cooley and Kohls.—RECORDS FROM LITERATURE: Grand County, 4 mi. N Thompsons [sic], July 31, 1940, *Pipestrellus* bats (J. Frenkle), Cooley and Kohls.⁶

8. *Ornithodoros talaje* (Guérin-Méneville).—NEW RECORDS: Kane County, "near" Echo Cliffs, Navajo Indian Reservation, Sept., 1939. Found unattached under a rock (S. and D. Mulaik).

9. *Ixodes sculptus* Neumann.—RECORDS FROM LITERATURE: Rich County, May 20, 1938, *Citellus armatus* (Eskey); Summit County, June 15, 1938, *Citellus armatus* (Eskey); June 13, 1938, *Citellus armatus* (Eskey), Cooley and Kohls.⁸ NEW RECORDS: Cache County, Logan Canyon Forestry Camp, Mar. 23, 1942, *Citellus armatus* (J. S. Stanford), U.S.A.C.; San Juan County, Abajo Mts., 5 mi. W. Monticello, July 5, 1947, pocket gopher (L. R. Edmunds); Dalton Spring, Abajo Mts., 5 mi. W. Monticello, July 5, 1947, pocket gopher (L. R. Edmunds); Gooseberry Ranger Station Elk Ridge, July 14, 1947, pocket gopher (L. R. Edmunds).

10. *Ixodes pacificus* Cooley and Kohls.—RECORDS FROM LITERATURE: Beaver County, Bush Creek, Oct. 20, 1938, human (Thorne); Washington County, "near" Pinto, Oct. 20, 1938, human (D. M. Rees); Bishopp and Tremble.² NEW RECORDS: Millard County, Holden, Oct. 25, 1945, human (D. M. Rees).

11. *Ixodes marmotae* Cooley and Kohls.—RECORDS FROM LITERATURE: Cache County, May 24, 1938, *Citellus armatus* (U.S.P.H. S.P.L.); Rich County, June 3, 1938, *Marmota* sp. (U.S.P.H.S.P.L.), Cooley and Kohls.⁸ NEW RECORDS: Box Elder County, "near" Lampo, July 9, 1942, *Marmota* sp. (J. S. Stanford), U.S.A.C.; Salt Lake County, Prairie Hollow, May 18, 1939, *Marmota* sp. (L. R. Edmunds).

12. *Ixodes kingi* Bishopp.—RECORDS FROM LITERATURE: Grand County, Sept. 1, 1940, prairie dog (R.M.L.); Sept. 2, 1940, prairie dog (R.M.L.); Millard County, Aug. 9, 1940, prairie dog (R.M.L.); Sept. 9, 1940, prairie dog (R.M.L.); San Juan County, May 1, 1937, prairie dog (Haas); Apr. 22, 1937, *Mustela* sp. (Haas); Apr. 21,

1937, *Mustela* sp. (Haas), Cooley and Kohls.⁸ NEW RECORDS: San Juan County, July 4, 1947, prairie dog (L. R. Edmunds).

13. *Ixodes angustus* Neumann.—NEW RECORDS: Cache County, Sardine Canyon, Dec. 28, 1937, weasel (Denning), U.S.A.C.; Camp Hunt, Aug. 14, 1942, shrew (J. S. Stanford), U.S.A.C.; Uintah County, Paradise Park, Aug. 7, 1947, pika (K. R. Kelson).

14. *Ixodes ochotona* Gregson.—NEW RECORDS: Uintah County, Paradise Park, July 31, 1947, pika (G. F. Edmunds, Jr.); July 22, 1947, pika (K. R. Kelson); July 30, 1948, pika (D. M. Rees).

15. *Ixodes spinipalpis* Hadwen and Nuttall.—NEW RECORDS: Uintah County, 1 mi. SE. Ouray, 1946 (J. Berryman), host unknown. These specimens were labeled "probably *spinipalpis*" at the R.M.L.

16. *Ixodes diversifossus* Neumann.—RECORDS FROM LITERATURE: Cache County, "near" Logan, July 28, 1931, cottontail rabbit (J. S. Stanford).

17. *Dermacentor albipictus* Packard.—RECORDS FROM LITERATURE: Bishopp and Trembley², Cooley³, report this tick as occurring in Utah, without giving specific collection data. NEW RECORDS: Cache County, Logan, Feb. 5, 1942, deer (Clamaine); Logan, Oct. 27, 1947, deer (Hobbs), U.S.A.C.; Daggett County, 18 mi. E. Linwood, Mar. 12, 1947, antelope (K. R. Kelson); Garfield County, Panguitch, March, 1948, horse (L. R. Edmunds).

18. *Dermacentor parumapertus* Neumann.—RECORDS FROM LITERATURE: Bishopp and Trembley², Cooley³, show this species on their distribution maps; Juab County, Trout Creek, May 6-8, 1934, jack rabbit (J. S. Stanford), Stanford.¹² NEW RECORDS: Kane County, 2 mi. SW. Kanab, May 20, 1947, jack rabbit (J. C. Downey); 3 mi. S. Kanab, May 23, 1947, jack rabbit (G. K. Todd); Kanab, May 24, 1947, jack rabbit (J. C. Downey); 2 mi. S. Kanab, May 24, 1947, jack rabbit (J. C. Downey); Hamblin Ranch, Cave Lakes Canyon, 5 mi. NE. Kanab, May 18, 1947, cottontail rabbit (G. K. Todd); House Rock, Arizona-Utah border, May 5, 1947, jack rabbit (L. R. Edmunds); San Juan County, 11 mi. N. Bluff, June 28, 1947, jack rabbit (L. R. Edmunds); Tooele County, Rush Valley, Dec. 30, 1947, jack rabbit (I. Bell).

19. *Dermacentor andersoni* Stiles.—RECORDS FROM LITERATURE: Many authors record this species in Utah. NEW RECORD: The most abundant tick in Utah, records are from the following counties: Cache, Davis, Duchesne, Emery, Garfield, Iron, Kane, Millard, Salt Lake, San Juan, Sanpete, Tooele, Utah, Wasatch. Numerous host species were recorded.

20. *Haemaphysalis leporis-palustris* (Packard).—RECORDS FROM LITERATURE: Box Elder County, July 22, 1931, pigmy rabbit (J. S. Stanford), Stanford.¹² Other authors show distribution on maps, Bishopp and Trembley,² and Hunter and Bishopp.¹⁰ NEW RECORDS: Emery County, 4 mi. N. Green River, June 22, 1947, cottontail rabbit (L. R. Edmunds); 4 mi. N. Green River, June 22, 1947, cottontail

rabbit (L. R. Edmunds); Grand County, Valley City, June 23, 1947, cottontail rabbit (L. R. Edmunds); Salt Lake County, Mill Creek Canyon, July 21, 1946, jack rabbit (H. Stark); San Juan County, 18 mi. E. Monticello, July 1, 1947, cottontail rabbit (L. R. Edmunds).

21. *Rhipicephalus sanguineus* (Latreille).—RECORDS FROM LITERATURE: Salt Lake County, Salt Lake City, May 15, 1943, dog (R.M.L.). Kohls and Parker.¹¹ NEW RECORDS: Salt Lake County, Salt Lake City, Oct., 1947, Mexican dog, [sic] (collector unknown).

REFERENCES CITED

- 1—BANKS, NATHAN, 1908. A revision of the Ixodoidea, or ticks, of the United States. Tech. ser. no. 15, Bur. Ent. U. S. Dept. Agr., pp. 1-60.
- 2—BISHOPP, F. C., and TREMBLEY, H. L., 1945. Distribution and hosts of certain North American ticks. J. Parasitol. 31:1-54.
- 3—COOLEY, R. A., 1946. The genera *Boophilus*, *Rhipicephalus*, and *Haemaphysalis* of the New World. Bull. (187) Nat. Inst. Hlth., pp. 1-51, 13 figs.
- 4—1938. The genera *Dermacentor* and *Otocenter* (Ixodidae) in the United States with studies in variation. Bull. (171) Nat. Inst. Hlth., pp. 1-89.
- 5—COOLEY, R. A., and KOHLS, G. M., 1941. Three new species of *Ornithodoros*. Pub. Hlth. Rept. 56:587-594.
- 6—1941. Further new species of *Ornithodoros* from bats. Pub. Hlth. Rept. 56:910-914.
- 7—1944. The Argasidae of North America, Central America and Cuba. Amer. Md. Nat., Monograph No. 1, p. 52.
- 8—1945. The genus *Ixodes* in North America. Bull. (184) Nat. Inst. Hlth., pp. 3-244, 87 figs.
- 9—DAVIS, GORDON E., 1941. *Ornithodoros parkeri* and relapsing fever spirochets in Utah. Pub. Hlth. Rept. 56:2464-2468.
- 10—HUNTER, W. D., and BISHOPP, F. C., 1911. Some of the more important ticks of the United States. Yearbook, Bur. Ent. U. S. Dept. Agric., pp. 220-230.
- 11—KOHLS, GLEN M., and PARKER, R. R., 1948. Occurrence of the brown dog tick in the Western States. Jour. Econ. Ent. 41(1):102.
- 12—STANFORD, J. S., 1934. Some ectoparasites of Utah birds and mammals. Proc. Utah Acad. Sci., Arts, and Letters, 11:247.
- 13—WOODBURY, ANGUS M., and HARDY, ROSS, 1948. Studies of the desert tortoise, *Gopherus agassizii*. Ecol. Monog. 18:145-200.

NEW SPECIES OF COLEOPTERA
FROM NORTH AMERICA

EDWIN C. VAN DYKE

California Academy of Sciences, San Francisco

CARABIDAE

Feronia (*Cryobius*) *bryanti* Van Dyke, new species

Small, narrow and elongate, moderately flattened, black and shining, legs rufous. *Head* somewhat longer than broad, as wide as apex of prothorax, front smooth, frontal grooves straight and well impressed; mandibles prominent, porrect; eyes moderately prominent; antennae long and delicate, extending backwards beyond base of elytra. *Prothorax* as broad as long, apex feebly emarginate, sides broadly arcuate in front, obliquely narrowed behind or sometimes feebly sinuate to obtuse hind angles; disc with median longitudinal line finely impressed, anterior transverse impression well defined, posterior transverse impression less evident, basal impressions linear and lunate in front, broad and deep behind, faintly double, basal area quite smooth, hind angles obtuse, base feebly emarginate and without margin. *Elytra* elongate, slightly cordate, broad at base with humeral angles prominent and well rounded, the sides almost parallel, broadly rounded posteriorly and feebly sinuate towards apex; disc feebly convex, more or less flattened, striae well impressed throughout and practically impunctate, the intervals convex, the third with three foveae. Legs long and delicate. Prosternum not margined apically. Male front tarsi well developed. Length 8.0 mm., breadth 2.75 mm.

Holotype male, *allotype* female (Nos. 6197 and 6198, California Academy Sciences, Ent.) and one male *paratype*, all collected by Owen Bryant, at AKLAVIK, MACKENZIE DELTA, NORTHWEST TERRITORY, Canada, June 16, 1931 (Bryant Lot 233).

This small *Platidius*-like beetle is closely related to *Feronia blaisdelli* Van Dyke (Pan-Pacific Ent., 19(1):24-25. Jan. 1943) but differs principally by having the sides of the prothorax oblique posteriorly and with obtuse hind angles, whereas *blaisdelli* has the sides of prothorax strongly sinuate posteriorly and the hind angles right-angled; the elytra rather cordate in shape with prominent humeri as against an elliptical afterbody with narrowed and oblique humeri; and well-impressed striae and convex intervals in contrast to the more feebly impressed striae and somewhat flattened intervals. The two species stand well apart from all other American species of the subgenus *Cryobius*.

ELATERIDAE

Athous farallonicus Van Dyke, new species

Elongate, subparallel, moderately convex, upper surface brown, the elytral suture and lateral margin, the underside, legs and antennae somewhat rufous. *Head* rather coarsely closely punctured, the front deeply triangulately impressed anteriorly, clypeal margin prominent, transverse, eyes large; antennae filiform, reaching in males two segments beyond hind angles of prothorax, in females barely to hind angles, the second segment small, but little longer than broad, the third almost twice as long as second and triangular, the fourth and fifth somewhat more robust, about one-and-a-half times as long as broad and feebly serrate, the sixth to tenth a bit longer, more parallel and gradually narrower and the eleventh elongate fusiform. *Prothorax* about a sixth longer than broad, apex feebly arcuate, base emarginate, sides sinuate behind, feebly arcuate in front and slightly narrowed at apex, apical angles blunt, not projecting, hind angles acute, without carinae, with sides elevated and extending somewhat backwards, the lateral margins narrow; the disc rather coarsely, not closely punctured except at sides, feebly depressed near front angles, with a median smooth longitudinal line more or less evidently especially posteriorly, without canaliculation, and sparsely clothed with rather coarse, forwardly inclined fulvous pile. Scutellum elongate, rounded at apex, coarsely punctured and setose. *Elytra* as broad as broadest part of prothorax, two and two-thirds as long, with sides quite parallel, the striae well impressed and coarsely punctured, the intervals convex, rugose and with coarse, sparse and inclined pubescence irregularly distributed along them. Beneath rather finely somewhat densely punctured. Legs long and delicate, the second and third tarsal segments of all legs somewhat prolonged beneath and feebly lobed. Length male, 11.0 mm., breadth 3.0 mm.

The female more robust, the antennae shorter and more delicate, the prothorax somewhat broader than long, with disc more convex and the sides more arcuate, and the elytra much more convex and expanded especially behind, giving the afterbody a spatulate appearance.

Holotype male, *allotype* female (Nos. 6199 and 6200, Calif. Acad. Sci., Ent.) and three *paratypes*, two males and one female, all collected by Dr. G. Dallas Hanna, during June, 1949, from the FARALLONE ISLANDS, 25 miles west of the Golden Gate, SAN FRANCISCO, CALIFORNIA. The five specimens were found on the ground and under cover.

This species is related to *Athous excavatus* (Motschulsky) and because of its brown color, looks more like the subspecies *carmeli* Van Dyke (see table, Proc. Calif. Acad. Sci., 20(9):363, and discussion, pp. 373-374, March 3, 1932). In *excavatus*, the pronotal

punctation is somewhat denser, the pubescence finer, longer and gray, the antennae more robust and longer, at least four antennal segments in the males extending beyond the hind prothoracic angles and the tarsal lobes a bit more pronounced. In most of the typical *excavatus* and many of the subspecies *carmeli* the sides of the prothorax are rufous, which is not the case with *farallonicus*.

BUPRESTIDAE

Acmaeodera boharti Van Dyke, new species

Rather small, moderately short and compact, the head and pronotum black or feebly aeneous and finely pilose, the head with white pile, the pronotum with erect black pile, the elytra a deep bluish-black, the under surfaces aeneous, and the insect as a whole somewhat shining and without maculations of any kind. *Head* coarsely, densely punctured, the front longitudinally impressed, transversely impressed at base of clypeus and the latter semicircularly emarginate in front; antennae short, reaching just beyond middle of prothorax, segments 5 to 10 serrate, the eleventh elliptical. *Prothorax* about twice as wide as long, apex feebly biemarginate, base transverse, sides unevenly arcuate and gradually narrowed from base to apex, the disc convex, coarsely, cribrately punctured laterally and rather finely, less densely punctured centrally, with a small feeble impression near center of front margin and a deeper one in front of scutellum, the lateral margin narrow but distinct though concealed when viewed dorsally. *Elytra* at base barely wider than base of prothorax, twice as long as broad, sides feebly sinuate in front of middle but in general gradually narrowed and convergent posteriorly to the rounded apex, the side margin serrate from middle to apex, the disc convex, somewhat flattened medially, the humeral umbone distinct, the striae finely, sharply impressed and finely closely punctured towards the suture, but outwardly very coarsely punctured except for the ninth and tenth striae which are very deeply impressed but less coarsely punctured, the inner intervals flattened and about twice as wide as the striae, becoming narrower and more irregular outwardly as the punctures increase in size, and with the last three more regular, very convex and rugose, each interval in addition with a single row of fine punctures from which arise a row of inclined white setae. Ventral surface shining, coarsely punctured in front and gradually more finely and sparsely punctured posteriorly and sparsely clothed with short, white pile. Prosternum with the front margin sinuate. The last ventral segment without a transverse lobe-like plate before apex. Length 8.0 mm., breadth 3.0 mm.

Holotype (No. 6201, Calif. Acad. Sci., Ent.), a unique collected at Ensenada Honda, Puerto Rico, West Indies, Aug. 20, 1942, by George E. Bohart.

This very distinct species is like no other described species from the West Indies, nor in fact like any from North America.

Chrysobothris sinaloae Van Dyke, new species

Of moderate size, chocolate brown in color and bronzed, somewhat narrow and elongate, and simulating *C. distincta* Laporte and Gory in general appearance. The clypeus broadly shallowly and feebly angulately emarginate with the outer angles of the emargination rounded, the antennae short, with the outer eight segments serrate and gradually narrowed towards the apex. *Prothorax* two-fifths broader than long, apex very feebly bisinuate, the base strongly so with the median lobe prominent, the disc somewhat convex, densely punctured, the punctures well separated centrally but approximate at sides and more or less arranged into transverse rugae, a slight median longitudinal impression generally reaching the apex but well separated from base, and the sides quite parallel in basal two-thirds, rounded in front and obliquely convergent to apex. *Elytra* three times length of prothorax, slightly broader at base than prothorax, humeri prominent, sides quite parallel or feebly sinuate for basal two-thirds, thence gradually narrowed towards apex and rounded to a blunt apex, the lateral margin serrate posteriorly and the disc feebly convex with three well-developed carinae, the sutural one straight and extending forwards two-thirds of the way towards the base, the second sinuate and extending forward from apex to beyond the middle and more or less paralleling the sutural, and the third or outermost, short, feebly arcuate and running from the posterior fovea toward the humeral umbone but generally not reaching it but turning outwardly, the general surface densely punctured especially toward the sides, with a deep fovea to the outer side of the scutellum, a feebly impression between that and the umbone and three well-defined, very densely punctured and somewhat cupreous foveae, the inner one about one-third the distance from the apex and to the outer side of the sutural carina, the second slightly forward of this, to the outer side of the second carina and at the apex of the short third carina, and the third fovea, about a third the distance from the base and straddling the apex of the second carina. The ventral surface bronzed and shining, the tarsi generally greenish, the ventral sclerites rather deeply sulcate medially, somewhat coarsely punctured, the abdomen strigate and clothed with a fine, white pile. In addition each sclerite has an elongate callosity at the side and the margin of the last ventral is finely serrate. The anterior femora have a well-marked tooth, serrate along the outer margin. Length 13 to 16 mm., breadth 5 to 6 mm.

Males with front flattened, densely, finely punctured, bright green, with a dense fine white pile; the antennae green, the front tibiae gradually dilated beneath at the apex, the last ventral segment broadly emarginate, the base of the emargination transverse or feebly sinuous, and the undersurface clothed with white pile, especially evident on the prosternum.

Females with front feebly convex, more coarsely punctured than in the male and rugose, with the pile sparser, both front and an-

tennae bronzed, the front tibiae feebly arcuate and enlarged outwardly but without apical dilation and the last ventral segments with a small notch at the apex.

Holotype male, *allotype* female (Nos. 6202 and 6203 Calif. Acad. Sci., Ent.) and 12 *paratypes*, collected at MORCORITO, SINALOA, MEXICO, Sept. 18, 1947, by Joseph Marquis. Three other specimens collected at Los Mochis, Sinaloa, on Nov. 15, 1947, were also taken by Mr. Marquis.

This species from the west coast of Mexico superficially looks like the larger and more distinctly sculptured *distincta* Laporte and Gory from the interior of Mexico and the smaller and shorter *schaefferi* Obenberger from Lower California, but both these in the male have a very distinct tooth near the apex of the front tibiae whereas in *sinaloae* the front tibiae in the males has only a sudden enlargement near the apex. According to Fisher's table (1942, U. S. Dept. Agric., Misc. Publ. No. 470), it would run close to *peninsularis* Schaeffer from Lower California but it differs from this by being larger, with a much broader prothorax, the males with a green forehead and the front tibiae with the apical enlargement a simple dilatation with at most a small tooth inwards whereas in *peninsularis* the forehead is bronzed and the front tibiae with a prominent tooth at the base of the enlargement.

CURCULIONIDAE

Eupagoderes bryanti Van Dyke, new species

Rather small, short and compact; clothed above with light brown and white scales irregularly distributed and closely applied in a tessellated manner; the head, a broad band at sides of prothorax and the underside with white scales, in close contact on the head and feebly imbricated at sides of prothorax and beneath; a band of brown scales on either side of the middle of pronotum and the hind femora barred. *Head* convex, a well-marked transverse impression separating it from the rostrum, the latter distinctly trisulcate, the median sulcus ending at the transverse impression and the lateral short but linear. *Prothorax* one-sixth broader than long, the sides arcuate, narrowing in front, almost parallel in posterior two-thirds, the disc with a few coarse punctures and numerous small ones but these latter are in most cases concealed by the dense scaly vestiture. *Elytra* cordiform, but little broader at base than base of prothorax, and almost a third longer than broad; disc evenly convex, the striae finely impressed and finely regularly punctured, the intervals feebly elevated centrally and with a row of minute punctures down their center from which arise very short curved setae. Legs robust, apices of hind tibiae obliquely truncate, the third tarsal segment enlarged and lobed. Length 8.5 mm., breadth 4.0 mm.

Holotype (No. 6204, Calif. Acad. Sci., Ent.) and 16 *paratypes*, collected in the BABOQUIVARI MOUNTAINS, ARIZONA, Sept. 23, 1933, by Owen Bryant.

This species along with *halli* Van Dyke and *huachucae* Van Dyke forms a small group of related species characterized by being of medium size, compact, with the rostrum trisulcate, the median sulcus not extending above the transverse impression, a maculate design, and the upper surface densely clothed with scales arranged in a definite tessellated or pavement manner. In *halli* the anterior tibiae are not serrate beneath, the head is flattened or but feebly convex with the result that the rostrum is not distinctly limited above by a transverse impression, the elytral striae sharply defined and the scales either black or white giving the beetle a gray appearance. Since the original description of *halli* based on five specimens was published, we have received 23 additional specimens all more or less uniform as to color and general appearance. In *bryanti*, a species of the same size and shape as the above, the anterior tibiae are serrate beneath, the scales are brown and white, the head feebly convex thus definitely limiting the rostrum above, and the elytral striae vaguely indicated, defined more by the row of striae punctures than the impressed striae. The pronotum is also so densely clothed with scales, more or less imbricated, that the coarse punctures are concealed which is not the case in either *halli* or *huachucae* where the scales are tessellated and numerous large punctures are exposed. Placed side by side the black and white scales of *halli* strongly contrast with the brown and white scales of *bryanti*.

Tosastes columbianus Van Dyke, new species

Black, densely clothed with imbricated scales, gray beneath, and gray above maculated with dark brown as follows: a broad band, narrowed on occiput, extending down the middle of the head and rostrum, another down the middle of pronotum, sometimes expanded so as to cover the entire disc, and irregular patches, often ocellate scattered over the elytra. *Head* slightly convex, separated from the rostrum by a feeble transverse impression, the rostrum broad, a bit longer than wide, somewhat flattened above in basal area and with the apex well arched; eyes of moderate size and quite flattened. *Prothorax* about one-third broader than long, sides feebly arcuate at middle, obliquely narrowed in front and quite straight and parallel behind, the disc coarsely, densely punctured and generally with a faint median longitudinal groove. *Elytra* oval, a bit broader at base than base of prothorax, broadest at middle, the disc convex, the striae well impressed and quite coarsely, regularly punctured, the

intervals convex and ornamented with an irregular double row of short, hooked setae. Legs stout, the hind tibiae subtruncate and with a double row of spines. Length 4.5 mm., breadth 3 mm.

Holotype (No. 6205, Calif. Acad. Sci., Ent.) and four *paratypes* collected at KAMLOOPS, BRITISH COLUMBIA, May 1, 1932, by Owen Bryant.

This small species structurally belongs near *Tosastes cinarescens* Pierce and superficially resembles some of the smaller, more irregularly maculate specimens. It differs, however, by having a narrower prothorax which is also more deeply and closely punctured, a head which is definitely convex, not flattened, a rostrum which is quite convex and depressed apically and with eyes which are more flattened.

Crocidema arizonica Van Dyke, new species

Elongate, dark brown, densely clothed with brownish or opalescent scales and with rather stiff hairs varying in degree from sparse to rather dense. *Head* as long as prothorax, the front moderately convex, with a well marked transverse impression between it and the arcuate beak, sparsely punctured, the punctures mostly concealed by the scales, and with semierect stiff pile, the rostrum narrower than interocular area in male, about as broad in female, quadrate; eyes large but quite flattened, projecting but little beyond side of head, the scrobes deep, not reaching eyes but curved beneath in front of eyes. *Prothorax* slightly broader than long in the male and considerably broader in the female, front margin feebly arcuate, transverse base, the sides arcuate, the disc rather densely punctured though the punctures are concealed by the scales and the post-ocular lobes are evident but not prominent. *Elytra* two and two-thirds times length of prothorax, elongate elliptical in the male, broader and slightly cordate in female, disc somewhat flattened, declivity rounded, the striae well impressed especially at sides and rather deeply punctured with rounded closely placed punctures, the intervals flat, very finely punctured and with the stiff pile irregularly distributed. The underside finely punctured and sparsely pubescent. Length male holotype 10.0 mm., breadth 3.5 mm., female allotype, length 11.0 mm., breadth 4.0 mm.

Holotype male, *allotype* female (Nos. 6206 and 6207, Calif. Acad. Sci., Ent) and six designated *paratypes* collected by Owen Bryant in the SANTA CATALINA MOUNTAINS, ARIZONA, the first July 15, 1938 (Lot 21), the second June 20, 1933, the others on July 15, 1938. I have associated with these various specimens from the Chiricahua Mountains and Santa Rita Mountains of Arizona, also one specimen from the Chisos Mountains of West Texas.

This species is rather closely related to *attenuata* Van Dyke (Pan-

Pacific Ent., 10(4):186-187, 1934) but differs by being generally larger and more robust, the scales more opalescent, the eyes less prominent, flatter, the funicular segments of antennae very similar in breadth whereas gradually wider apically in *attenuata* and the elytral striae generally deeper and the punctures coarser.

Peritaxia longipennis Van Dyke, new species

Rather large for the genus, narrow, elongate, black, antennae and tarsi rufopiceous, densely clothed with very closely applied scales which appear of the general body color though they are somewhat opalescent under good light and high magnification, and are arranged in a tessellated manner, and sparsely pilose, the pile semi-erect and denser on head and elytral declivity. *Head* one-third longer than prothorax, convex above, feebly flattened in front, finely punctured behind, coarsely punctured in front, distinctly separated from rostrum by a rather deep transverse impression; the rostrum broad, feebly arcuate, coarsely, densely punctured, wider in front and triangulately emarginate apically; the antennae with scape long and clavate, the funicle with the first and second segments twice as long as broad, segments 3 to 7 slightly longer than broad, the terminal segment long and fusiform, almost equal in length to the three preceding segments; the eyes feebly convex and moderately prominent. *Prothorax* two and one-half times as broad as long, base and apex transverse, sides evenly and moderately arcuate, disc feebly convex, finely granular in appearance as a result of the scales, with a well-impressed narrow line medially, and a moderate number of coarse, well-spaced punctures but coarsely punctured and rugose laterally. *Elytra* two and a half times as long as prothorax and about one-fifth longer than broad; base feebly emarginate, basal angles right angled though feeble, disc convex, the declivity abrupt, almost perpendicular, the striae well defined by the coarse, closely placed punctures, the intervals almost twice as wide as striae and feebly convex. Ventral surface rather finely, densely punctured and sparsely pubescent. Length 9.0 mm., width 4.0 mm.

Holotype (No. 6208, Calif. Acad. Sci., Ent.) and one *paratype* collected in OAK CREEK CANYON (south of Flagstaff), ARIZONA, July 25, 1936, by Owen Bryant.

This species when compared with larger specimens of *rugicollis* Horn appears generally narrower and more elongate, the pronotum less markedly rugose, the elytra much longer and elliptical with humeri angles small, not somewhat cordate and pronounced, and the striae punctures more numerous and rounded. Other described species are generally smaller, proportionally shorter, with the pronotum more rugose, the elytra more cordate in shape and with prominent humeral angles.

Onychobaris langei Van Dyke, new species

Elongate oval, convex, subopaque, the general surface alutaceous, black, the legs piceous or sometimes feebly rufous, setae very minute and inconspicuous. *Head* sparsely, finely punctured, sometimes with a small fovea at base of rostrum, the rostrum about 1.5 mm. long, evenly arcuate, of moderate robustness, rather coarsely punctured towards base and finely towards apex. *Prothorax* robust, slightly broader than long, with sides evenly arcuate, the apex constricted, the base broadly bisinuate, the median lobe wide and prominent, the disc rather coarsely, densely punctured, the punctures contiguous laterally, and with a well marked median smooth line. Scutellum transverse and feebly impressed at center. *Elytra* almost a third longer than broad with rather prominent humeri which make the elytra wider there than the base of the prothorax, with sides feebly convergent posteriorly, well-rounded at apex, the disc with coarse, deep and abrupt striae, the intervals flat, equal, distinctly wider than striae, each with a single series of well-impressed rounded, contiguous punctures. Beneath coarsely, closely punctured laterally, more finely and sparsely at center of abdomen. Length 5.0 mm. excluding beak, breadth 2.5 mm.

Holotype (No. 6209, Calif. Acad Sci., Ent.) and seven *paratypes* collected by Dr. W. H. Lange at EL SEGUNDO, LOS ANGELES Co., CALIFORNIA, September 28, 1938. They were found on *Oenothera spiralis*, close to the roots. Four specimens were returned to Dr. Lange.

The species, according to Colonel Casey's key (Col. Notices IV, 1892, pp. 522-524), runs close to *molesta* Casey from Arizona, but aside from locality, differs by having dense approximate pronotal punctures, confluent at sides, a very much more distinct median smooth line on disc, a less robust rostrum, a subopaque or duller appearance, and piceous instead of red legs.

DEROBRACHUS GEMINATUS ON GRAPE ROOTS

(Coleoptera: Cerambycidae)

Larvae of *Derobrachus geminatus* Leconte were found feeding on grape root stock near Indio, California, August 30, 1950, by Mr. B. Laffin. The land had been cleared for about one year. Formerly it had been covered by mesquite (*Prosopis glandulosa* Ckll.), a natural host of the beetle. Mr. Laffin tells me he has found four other such cases. I am indebted to Dr. E. C. Van Dyke for identifying the specimens.—Sherman L. Thomas, Indio, California.

OFFICIAL SEAL CONTEST

It has long been felt that the Pacific Coast Entomological Society should have some significant identifying seal which could be affixed to official Society documents, stationery and publications. To stimulate interest in the choice of this official seal, it has been decided to conduct a contest for the purpose of selecting the best and most appropriate design to be submitted by a reader of the *Pan-Pacific Entomologist*. The person who creates the chosen seal will receive a complete up-to-date set of the *Pan-Pacific Entomologist*.

Contest entries should be drawn in large size on heavy white paper (8½ x 11). All drawings must be carefully inked. It is considered advisable to include the title "Pacific Coast Entomological Society" as an integral part of the official seal, so be sure to include this printing on the submitted design. The name and address of the contestant must appear on the *reverse* side of each contest entry. Mail the completed drawings to Dr. J. Gordon Edwards, Department of Natural Sciences, San Jose State College, California, postmarked on or before April 1, 1951.

After a preliminary screening, the surviving entries will be examined by a board of entomologists who will choose a number of the most appealing entries for further consideration. The remaining drawings will then be photographed and a lantern slide of each will be projected for viewing by the members present at the May meeting of the Pacific Coast Entomological Society. The final winning seal will be chosen by popular vote at that time—J. GORDON EDWARDS.

— EDITORIAL NOTES —

The editors wish to draw to the attention of contributors to the *Pan-Pacific Entomologist* an article "Notes on writing sentences," by J. Ansel Anderson, which appeared in the *80th Annual Report of the Entomological Society of Ontario*, pages 7 - 10. 1949 [1950].

E. C. VAN DYKE HONORED

Dr. Edwin C. Van Dyke has been notified of his election by popular ballot to the presidency of the Coleopterists' Society. Dr. Van Dyke, who will be 82 on April 7, is Emeritus Curator of Entomology at the California Academy of Sciences, where he donates his time six days a week. He is currently finishing a monograph on the Coleoptera of the Galapagos Islands.

THE ENTOMOLOGICAL SOCIETY OF CANADA

At the eighty-seventh annual meeting of the Entomological Society of Ontario, held at Guelph on November 1 - 3, 1950, it was decided to form a national society, to be called the Entomological Society of Canada. The new society will serve as a link between the various regional societies, namely, the Acadian Entomological Society, the Entomological Society of Ontario, the Entomological Society of Manitoba, the Entomological Society of British Columbia, the proposed entomological society of Quebec, and others that may be established. *The Canadian Entomologist* will be published jointly by the Ontario and the national societies, Dr. W. R. Thompson continuing as Editor, with Dr. G. C. Ulyett as Associate Editor.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

E. O. ESSIG
Vice-President

R. L. USINGER
President

D. D. JENSEN
Secretary

PROCEEDINGS

Two Hundred and Ninth Meeting

The two hundred and ninth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on January 28, 1950, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ferris conducted the meeting. The following members were present: R. F. Fritz, E. G. Meyers, J. P. Harville, J. W. Tilden, E. O. Essig, A. E. Michelbacher, E. G. Wegenek, E. C. Van Dyke, H. B. Leech, S. L. Thomas, V. Stompler, A. Retan, P. H. Arnaud, Jr., C. P. Hoyt, F. X. Williams, J. W. Green, B. Brookman, B. D. Culver, D. C. Thurman, Jr., E. B. Thurman, J. E. Gillaspay, D. P. Furman, W. W. Middlekauff, L. W. Quate, D. Gould, R. L. Usinger, P. D. Hurd, Jr., W. Barr, E. G. Linsley, W. D. Murray, T. Aarons, L. P. Coy, O. W. Graf, Jr., W. Hoyt, E. L. Kessel, C. W. Hildebrand, R. C. Miller, R. M. Bohart, R. Potts, D. D. Jensen, and W. H. Lange. The following visitors were present: Doris R. Thomas, Harold W. Brydon, Howard H. Abram, J. M. Savage, R. R. Harry, J. N. Simons, Harry Freeman, Heidi Aarons, J. E. Ryus, Mrs. R. M. Bohart, J. Bohlke, G. S. Myers, P. S. Lange, and J. W. Skousen.

The minutes of the meeting held December 3, 1949, were read and approved.

The membership committee proposed and the Society elected C. A. Downing and Harold A. Brydon as members.

The President then called for notes, exhibits and remarks. Dr. Ross reported that the Academy is considering a Hall of Insects for public display, and discussed briefly the type of exhibits being proposed.

Dr. Ross exhibited specimens of a rare arthropod class, the Pentastomida. These had been taken from the liver of an African rock python, collected by Borys Malkin in the British Cameroons, May 28, 1949. The cork-screw form of the body shows no obvious relationship to the other arthropods even though it is considered to be related to the mites. Dr. Ross also exhibited a box of 108 microscope slides each bearing the male and female of a separate species of flea. This is one of 20 such exhibit sets of fleas prepared by C. A. Hubbard to be used with his book on fleas. The first set was deposited in the U. S. National Museum and the second is in the California Academy of Sciences.

Mr. H. B. Leech circulated a publication on the Siphonaptera of Canada by George P. Holland.

Dr. Richard Bohart exhibited two species of Strepsiptera, one of which is parasitic on the Thysanura and the other on the Pentatomidae. The latter has been used in biological control efforts against a bug which is a pest of coffee in Africa.

Mr. Aarons reported that preliminary plans are being drawn up for a study of the flight range of the mosquito *Aedes squamiger* (Coq.) in the San Francisco Bay area. The mosquitoes, emerging from 20 acres of the Petaluma Creek basin area, will be marked and attempts will be made to recover them at various locations in the bay region. The details of the experiment have not been decided upon but marking will probably be accomplished by using a fluorescent dye.

President Ferris introduced as the main speaker of the meeting, Dr. Robert L. Usinger, Associate Professor of Entomology, University of California, Berkeley, who spoke on the subject: "The Paris Meetings of the International Commission on Zoological Nomenclature."

The situation as regards international nomenclature before the Paris Meetings was briefly outlined and was followed by an account of the actual meetings held in Paris.

Important decisions such as liberalizing the procedure of the Commission, defining the term "binary," providing for infra-sub-specific categories and clarifying the subject of homonyms were discussed in some detail.

Finally, the events subsequent to the Paris meetings were outlined, including publication of the proceedings.

Dr. Usinger's report stimulated considerable discussion and questions among the members present before the meeting was adjourned at 4:30 p.m.—D. D. JENSEN, *Secretary*.

Two Hundred and Tenth Meeting

The two hundred and tenth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on February 25, 1950, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ferris in the chair. The following members were present: G. F. Ferris, D. D. Jensen, W. W. Middlekauff, A. E. Pritchard, H. H. Abram, R. L. Usinger, B. Brookman, C. D. Grant, O. W. Graf, Jr., J. W. Tilden, W. C. Day, J. N. Simons, W. H. Nutting, T. W. Cook, V. Stompler, C. H. Spitzer, Jr., K. Innes, B. B.

Kessel, E. L. Kessel, P. H. Arnaud, Jr., C. A. Downing, E. S. Ross, J. W. Green, W. Barr, C. Don MacNeill, H. A. Scullen, M. Marquis, S. L. Thomas, E. C. Van Dyke, E. G. Wegenek, A. E. Michelbacher, E. O. Essig, J. W. MacSwain, H. B. Leech, H. H. Blakemore, F. X. Williams. Visitors were present as follows: Rex Bartges, L. P. Coy, Marian Kendall, Sylvia Spitzer, Don Kelley, W. C. Bentinck, F. L. Rogers, Joy Hogan, Lucy Jones, Allen Bartel, Enid Moor, Doris R. Thomas, Gretchen Baumgartner, Lois MacDonal, Metta Weddleton, Linda Sorensen, Franklin Devore, John Schmiedel, Sally Barrett, Christine Owens and Borys Malkin.

The minutes of the meeting held January 28, 1950, were read and approved.

The membership committee proposed and the Society elected the following as members: J. H. Freitag, F. C. Hottes, B. J. Spencer, Ernest R. Tinkham, and Howard Abram.

The President appointed a committee, composed of Dr. Tilden and Dr. Ross, to determine the location for the annual field meeting and report at the next meeting.

The President called for notes, observations and exhibits. Dr. Ross called attention to a display of some of the 250,000 insects collected by Mr. Malkin in Africa.

Dr. Usinger displayed the superb illustrations made by Arthur Smith of the British Museum of 50 new genera of Aradidae. In the past only 50 genera were known in this family. The large number of new genera were found by Dr. Usinger because it was previously not recognized that adult aradids could be wingless. Heretofore such specimens were considered to be nymphs.

The President then introduced as the main speaker of the meeting, Mr. Borys Malkin, Research Associate of the California Academy of Sciences, who spoke on "Entomological Observations in Africa." A summary of Mr. Malkin's discussion is given below.

Mr. Malkin spoke of his experiences during a 16 month trip in Africa, from August, 1948, until December, 1949. The first three months were devoted to collecting in North Africa starting off from Tripoli through Tunisia and into Algeria. Desert conditions prevailed throughout most of this territory except for a relatively narrow strip around Algiers. A bus trip southward through the Sahara desert, French Sudan and Dahomey into Nigeria marked the second stage of the journey. Mr. Malkin remained in Nigeria and the British Cameroons nearly 7 months and covered a considerable portion of the colonies. Here the work extended from the peak of the dry season to the peak of the rainy season during which time considerable change occurred in the composition of the insect fauna. Collecting on the whole was strenuous and not too rich except for aquatic Coleoptera and Hemiptera of which nearly 15,000 specimens were

taken. Concentration of species even in a small body of water was enormous and a count, from a tiny pond in Ogbomosho, Southern Nigeria, showed over 100 species of aquatic Coleoptera. The rain forest was limited to the southernmost part of the colony and even here it had been practically eliminated by intense cultivation. However, great stretches of such forests still survive in the Benin province in the Niger Delta and are practically untouched in the Southern Cameroons.

Over a month was devoted to working up the various vegetation zones of Mt. Cameroon which practically rises from the sea, with mangrove swamps at the bottom and the rain forest belt at about 2,500 feet. Next comes mid-mountain forest up to 4,500 feet. It is this zone which he found richest in insect life. One of the characteristic forms was a staphylinid *Osorius* later also found on São Tomé Island in the Guinee Gulf and in the Knysna Forest in South Africa. Above 4,500 feet, ringed by tree ferns, occurs the mist forest which extends to 7,500 feet in places. In this zone the fauna is distinctly impoverished. Above the forest are grasslands to 10,000 feet where the last trees disappear with mosses and lichens taking over to the peak. At 10,000 feet very few insects occur, the most characteristic form being sawflies.

In June, 1949, Mr. Malkin moved into the French Cameroons, working over into the grassy highlands, and in July to the Portuguese Island of São Tomé where an endemic and presumably new species of *Licinius* was collected in the mountains. During August and September Angola was explored. The Northern Highlands of this colony show close relationship to the Cameroons and Nigeria whereas the arid coastal strip and the sandy eastern part of the colony resemble the Kalahari sands. Hardly any duplication occurred in species and such groups as the chrysomelids, buprestids, meloids and cincindelids occurred in particular abundance.

The last six weeks of the expedition were devoted to the exploration of the Eastern Cape province and parts of Namaqualand, the latter trip undertaken jointly with Dr. Karl Koch, an entomologist of the Transvaal Museum in Pretoria. Work in the mountains back of Capetown revealed an entirely different fauna, such groups as melyrids, malachiids and clerids being especially numerous. The virgin forest of Knysna, a coastal strip along the southern shores, reminded Mr. Malkin very much of the western Oregon forests. Trips up Table Mountain, especially to Blinkwater Falls, yielded several new genera and species of hydrophilids, some of which show affinities to the Chilean fauna.

In addition to his comments on entomological exploration Mr. Malkin discussed particularly the local mode of travel and living conditions in the various areas visited.

After a discussion of Mr. Malkin's talk, the meeting was adjourned.—D. D. JENSEN, *Secretary*.

Two Hundred and Eleventh Meeting

The two hundred and eleventh meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on April 1, 1950, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ferris conducted the meeting. The following members were present: G. F. Ferris, D. D. Jensen, R. L. Usinger, J. W. MacSwain, E. R. Leach, E. O. Essig, F. X. Willams, B. D. Culver, D. P. Furman, B. Brookman, W. W. Sampson, H. B. Leech, E. C. Van Dyke, H. W. Brydon, C. A. Downing, C. W. Hildebrand, K. F. Innes, Jr., J. W. Tilden, J. R. Walker, G. F. Augustson, R. C. Miller, E. S. Ross, P. A. Adams, A. E. Pritchard, E. G. Wegenek, W. C. Bentinck, A. E. Michelbacher, T. W. Cook, and E. L. Kessel. The following visitors attended: Mrs. G. F. Augustson, Ruth Vickery, H. E. Stark, W. H. Renner, L. P. Coy and F. M. Prince.

The minutes of the previous meeting were read and approved.

The membership committee proposed and the Society elected William C. Bentinck as a member.

Dr. Ross, Chairman of the field meeting committee, reported that Portola State Park in San Mateo County had been selected as the site for the annual field meeting which will be held May 7, 1950.

In response to the President's call for notes, exhibits and remarks, Mr. H. Leech reported that Mrs. Fred Winters of Santa Barbara had made a gift to the Academy of the collection of water beetles, particularly Hydrophilidae, made by her late husband.

Dr. Ross reported that Dr. L. Hewes, an amateur lepidopterist, of San Francisco, died recently and had willed his collection of butterflies to the Academy.

Professor Ferris called attention to the recent death of Dr. P. N. Annand, Chief of the U. S. Bureau of Entomology and Plant Quarantine and former member of the Society.

Dr. MacSwain reported that the University of California field course in entomology will be held this summer in the San Gabriel Mountains and invited members of the Society to visit the camp.

Dr. Kessel raised the question of having some meetings of the Society in the evening instead of Saturday afternoon. After some discussion a motion was made and carried that the Program Committee schedule at least one evening meeting during the fall season.

President Ferris then introduced F. M. Prince, Medical Entomologist of the Western Communicable Disease Center Laboratory, San Francisco, who addressed the Society on the subject: "Objectives and Methods in Studies of Plague Transmission." Mr. Prince's remarks are summarized below.

Plague first appeared among humans and rats in San Francisco in 1900 and was discovered among California ground squirrels in

1908. Since 1934, the Public Health Service has extended the search for plague in wild and domestic rodents and their ectoparasites to 17 Western States. Plague has been found in 137 counties in 15 States. The infection was demonstrated most frequently in ground squirrels, marmots, prairie dogs, and wood rats.

Transmission studies were conducted with different species of wild and domestic rodent fleas using white mice as the test animal for the studies. A series of slides in color demonstrating techniques in conducting the studies were shown. Color microphotographs illustrating the evolution of plague masses in a wild rodent flea (*Monopsyllus wagneri*), and a domestic rat flea (*Xenopsylla cheopis*) were also presented. The development of mass formations in wild rodent fleas is usually quite different from that of *X. cheopis*. Masses usually originate in the stomach of wild rodent fleas and take several weeks or months to produce complete blockage of the stomach, whereas, the masses originate in the proventriculus of *X. cheopis* and produce complete blockage in a much shorter period. Under laboratory conditions *X. cheopis* proved to be the most efficient vector of plague tested.

Following a discussion of Mr. Prince's talk, the meeting was adjourned.—D. D. JENSEN, *Secretary*.

Two Hundred and Twelfth Meeting

Portola State Park, May 7, 1950

The two hundred and twelfth meeting of the Pacific Coast Entomological Society was held as the annual field meeting at Portola State Park, San Mateo County, May 7, 1950.

The recorded attendance was 59 persons, including 14 members, 20 adult visitors and 25 children. The following members were present: Howard Abram, P. H. Arnaud, E. S. Ross, E. C. Van Dyke, F. X. Williams, W. H. Lange, H. B. Leech, J. W. Tilden, O. W. Graf, M. Marquis, J. H. Freitag, D. D. Jensen, A. E. Pritchard, and A. E. Michelbacher. Visitors were present as follows: Mrs. Howard Abram, Marguerite Arnaud, K. G. Swenson, Vaudis Swenson, Winona C. Farr, Mr. and Mrs. Ernest Schneider and family, Pauline Lange and family, Dr. and Mrs. Steve Dorman and family, Hazel Tilden and son, Anne Minaker, Mrs. M. Marquis, Steven D. Marquis, Elinor B. Freitag, Mr. and Mrs. J. L. Brady, Dr. and Mrs. E. S. Sylvester and family, Dr. and Mrs. Eugene Stafford and family, Mrs. A. E. Michelbacher.

The weather was good and although some collecting was done most of the time was spent in visiting.—D. D. JENSEN, *Secretary*.

Two Hundred and Thirteenth Meeting

The two hundred and thirteenth meeting of the Pacific Coast Entomological Society was held at 8:00 p.m. on October 13, 1950, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ferris conducted the meeting. The following members were present: Berta B. Kessel, E. L. Kessel, A. E. Michelbacher, E. O. Essig, M. Marquis, W. C. Day, G. F. Ferris, R. L. Usinger, E. C. Van Dyke, S. B. Freeborn, W. W. Middlekauff, J. W. Tilden, P. A. Harvey, W. Hazeltine, P. D. Hurd, Jr., F. X. Williams, J. E. Gillaspay, J. G. Edwards, P. H. Arnaud, L. M. Henry, C. D. Duncan, H. B. Leech, L. W. Quate, J. W. MacSwain, L. P. Coy, W. C. Bentinck, S. G. Watkins, C. A. Downing, E. S. Ross, D. D. Jensen, and G. A. Marsh. Visitors were present as follows: Bernard Adelson, Robert Schuster, Harold Stark, Harry L. Hansen, S. C. Daniels, Lynne Scott, Neva Duncan, W. F. Ehrhardt, Mrs. J. W. MacSwain, Norman Lewis, and G. F. Edmunds.

The minutes of the meeting held April 1 and of the field meeting held May 7, 1950, were read and approved.

The membership committee proposed and the Society elected the following as members: Mrs. Ruth C. Whitney, Robert Snelling, and Gordon Marsh.

President Ferris appointed H. B. Leech, Paul Arnaud and J. W. MacSwain as a committee to propose a slate of officers at the annual meeting in December.

Dr. Hurd, chairman of the committee appointed to review the constitution, distributed mimeographed sheets carrying proposed modifications in the by-laws of the Society which will be acted upon at a later meeting.

President Ferris asked for an expression of opinion from the members present regarding the time of day meetings should be held. After some discussion a motion was made and carried that the meeting time alternate between afternoon and evening.

In response to the President's call for notes and exhibits Dr. Duncan displayed a species of syrphid fly which has been very abundant at San Jose for the past six weeks. The species, *Tubifera aenea* (Scopoli), was found clustered in large numbers in paper bundles, wrappings and other secluded places. Dr. MacSwain reported that this species commonly infests solitary wasp cells, and cracks, and suggested that the flies might be getting ready for hibernation.

Dr. Duncan also reported that the owner of a new home in San Jose had become alarmed because a bostrychid, *Stephanopachys pacificus* Casey, infested the lumber of the house. Both larvae and adults were found. Although mainly in the sapwood under the bark, specimens were also found deep in the wood. Dr. Van Dyke expressed the opinion that the species would not breed very long in finished lumber.

Dr. Duncan reported an infestation of dry wood termites in a piece of solid wood. The reproductive alates were found.

Dr. Edwards reported finding a female of *Poreospasta polita* Horn mating with a male of *Lytta auriculata* Horn, and commented that this observation is additional evidence that the two species are closely related, as indicated by Dr. MacSwain's larval studies.

Professor Ferris called attention to a fine collection of bedbugs which he had brought with him and which were available for examination.

President Ferris introduced as the main speaker of the meeting, Mr. George F. Edmunds, Jr., of the University of Utah, who spoke on the subject: "Notes on the mechanics of flight and wing venation of the Ephemeroptera and their ancestors, with remarks on the archetype wing venation of the insects." The talk was based on studies conducted jointly by Mr. Edmunds and Jay R. Traver of the University of Massachusetts. A summary of the talk, which was illustrated by lantern slides and a cardboard model of an insect wing, is summarized below.

The typical forewing of a mayfly is triangular in shape, and fan-like in appearance due to corrugations, or fluting, resulting from a complete alternation of concave and convex veins near the margin of the wing. The corrugations strengthen the wing and make it more rigid. The convex veins brace the wing on the downstroke and the concave veins brace it on the upstroke. The wing is further strengthened by the close grouping of the costa, subcosta and radius 1 which are held firmly together by a costal brace.

Although the mayfly wing appears to be wholly rigid, some of the main longitudinal veins have obvious weakened spots or bullae midway of their length. These bullae allow the concave veins to bend sharply and consequently fail to support the distal half of the wing on the upstroke. From these facts it can be seen that the corrugations or fluting of the wing, and the bullae serve important flight functions. On the downstroke, the wing remains rigid and the insect gets a maximum amount of lift and propulsion. The failure of the bullae equipped veins to support the wing tip, however, allows the distal half of the wing to bend downward on the upstroke as a result of the pressure of the opposing air. Thus the air slips away in such a manner as to offer lessened resistance to the wing.

When examined in cross section it is seen that in general the convex veins belong to the upper wing surface and the concave veins to the lower wing surface. All veins and cross veins appear to be arranged in such a way as to brace the wing.

The mayfly wing is apparently an excellent lift type wing but it is not adapted for speed. In those insects that fly rapidly the anterior margin of the wing is rigid, and the remainder of the wing membrane is flexible. These insects fly by means of a sculling action in which the rigid anterior margin leads the membrane in the direction of the wing stroke. Experiments and observations on the Ephemeroptera indicate that the fluted wing seriously interferes

with sculling action. But in some Ephemeroptera such as *Lachlania* the fluting of the wing has been interrupted by the loss of many intercalary veins and these mayflies appear to be the strongest fliers in the order. They clearly demonstrate the superiority of the sculling type over the fluted wing.

At the present time there seems to be no adequate explanation of the origin of fluting in insect wings, but the speaker's study of the mechanics of mayfly flight have led him to believe that fluting of the wing was an adaptation, which added rigidity to the wing as it thinned out into an effective flight surface. The most ancient winged insects are found in the Upper Carboniferous, but it is evident from the great variety of wing types in these fossils that the first winged insects are of greater antiquity. Entomologists have thus had to hypothesize as to the nature of the wings of the first pterygote insects. The present concept of this archetype venation is illustrated by Snodgrass (Fig. 121A) in his *Principles of Insect Morphology*. The veins in this archetype are considered to be either concave or convex in position but there is no complete or functional fluting.

We, therefore, offer the hypothesis that the archetype wing was a completely fluted wing with intercalary veins, not too unlike that of *Lithoneura mirifica* Carpenter, an Upper Carboniferous paleodictyopteran believed to be very close to, if not on, the ancestral line of the mayflies. The fossil record clearly shows that the so-called intercalary veins are true veins and that their free basal ends are a secondary condition.

Several facts seem to support the idea that the wings of the first pterygote insects were completely fluted. In all the winged orders the veins show evidence of being concave or convex and the veins often appear to belong to one surface or the other in cases where the concave or convex positions are obscure. As this seems to be of no functional value in most orders, we would consider these to be vestiges of once functional structures. The fact that fluting is more common in Upper Carboniferous forms than in recent forms would seem to be an additional evidence. The concept of an archetype wing with complete fluting also indicates an adaptational significance to the evolutionary trends of fluting in insect venation.

Even though fluting appears to have been necessary for the thinning out of the wings into effective flight surfaces, it would be a detriment to the development of the rapid sculling type of flight. The trend in the evolution of insect wings seems to be from the fluted type toward the speed type wing with a rigid anterior margin and a comparatively flexible membrane.

In light of the hypothesis that the completely fluted wing is more primitive than that generally conceded to be the archetype venation, the origin and major phylogenetic lines of ephemerid evolution were discussed in some detail.

After considerable discussion the meeting was adjourned.—D. D. JENSEN, *Secretary*.

Two Hundred and Fourteenth Meeting

The two hundred and fourteenth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on December 9, 1950, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ferris conducted the meeting. The following members were present: J. H. Freitag, C. D. MacNeill, P. A. Adams, Gene Morris, E. C. Van Dyke, R. L. Usinger, E. O. Essig, W. C. Day, J. W. MacSwain, F. X. Williams, Wm. Hazeltine, R. L. Doutt, E. G. Linsley, H. W. Brydon, C. P. Hoyt, C. L. Scott, P. H. Arnaud, K. F. Innes, E. L. Kessel, W. D. Murray, R. C. Miller, H. B. Leech, S. G. Watkins, J. G. Edwards, L. M. Henry, J. W. Tilden, G. A. Marsh, J. P. Harville, E. A. Smith, W. C. Bentinck, R. Snelling, J. J. De Bois, G. F. Ferris, B. E. White, A. E. Pritchard, L. R. Gillingly, D. J. Gould, P. D. Hurd, Jr., L. W. Quate, J. W. Green, O. W. Graf, Jr., and D. D. Jensen. The following visitors were present: E. S. Sylvester, Phyllis Morris, Allan D. Telford, J. F. Reinhardt, F. H. Lauret, Y. Tanada, H. R. MacCarty, Mrs. Burdette White, T. F. Stubbs, Norman Lewis, A. A. Hubert, Barbara Prendergast, and Benjamin Keh.

The minutes of the meeting held October 13, 1950, were read and approved. The membership committee proposed and the Society elected the following new members: W. H. Wade, Elbert B. Dixon, P. D. Gerhardt, Alexander A. Hubert, and Charles L. Scott. Professor Essig read a report of the historical committee outlining recommendations for the commemoration of the fiftieth anniversary of the Society in 1951. Dr. Miller presented a financial report of the Society up to November 30, 1950. Mr. Day reported that the auditing committee had examined the financial records of the Society and found them in good order.

The President then called for notes, exhibits and remarks. Mr. Arnaud exhibited a collection of males of an undescribed species of braconid in the genus *Blacus* which he had observed swarming on a number of occasions, usually in the early evening, both in the spring of 1948 and 1949 at Redwood City.

Mr. Leech, representing the nominating committee, proposed and the Society elected the following officers for 1951: R. L. Usinger, President; E. O. Essig, Vice-President; D. D. Jensen, Secretary; R. C. Miller, Treasurer; and E. L. Kessel and G. F. Ferris, Executive Board Members at Large.

Dr. Edwin C. Van Dyke, only living charter member, was elected Honorary President of the Society for the semicentennial year 1951.

The chairmanship of the meeting was then turned over to the president-elect, Dr. Usinger, who called on Professor Ferris to give his retiring presidential address entitled "Entomology, Aesthetics and Science." Professor Ferris' address created considerable interesting discussion before the meeting was adjourned.—D. D. JENSEN, *Secretary*.

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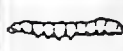
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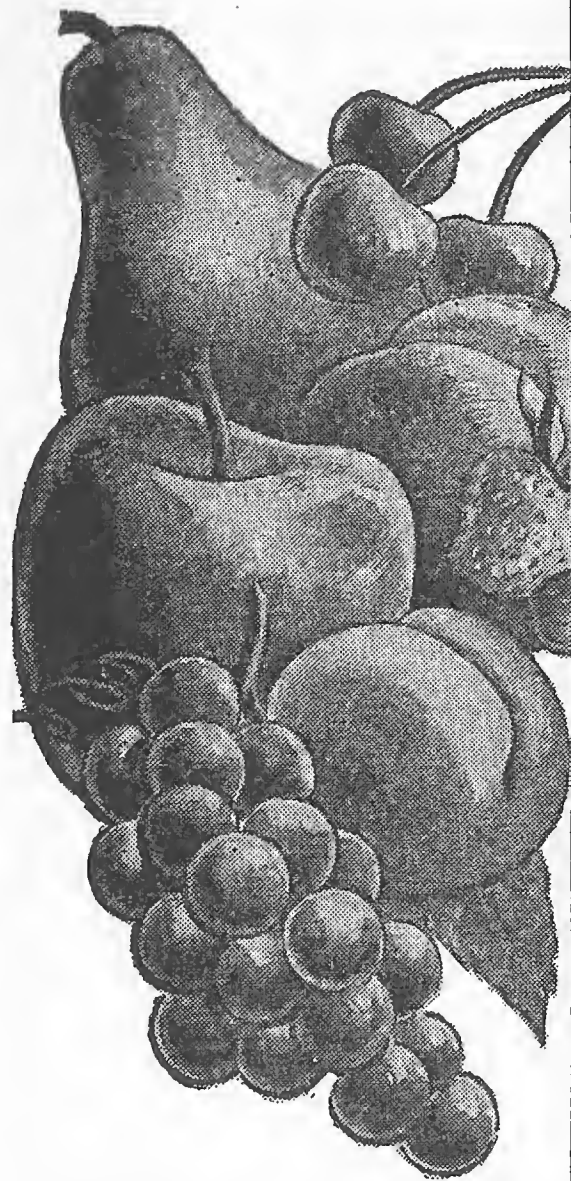
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BULLETIN OF ZOOLOGICAL NOMENCLATURE

Arrangements have been made for completing vol. 1, and for the publication of volumes 2 (applications in regard to nomenclatural problems), 3 (documents considered by the International Commission on Zoological Nomenclature at Paris, 1948), 4 (Official Record of the International Commission at Paris), and 5 (Official Record of the section on Nomenclature of the thirteenth International Congress of Zoology at Paris, 1948).

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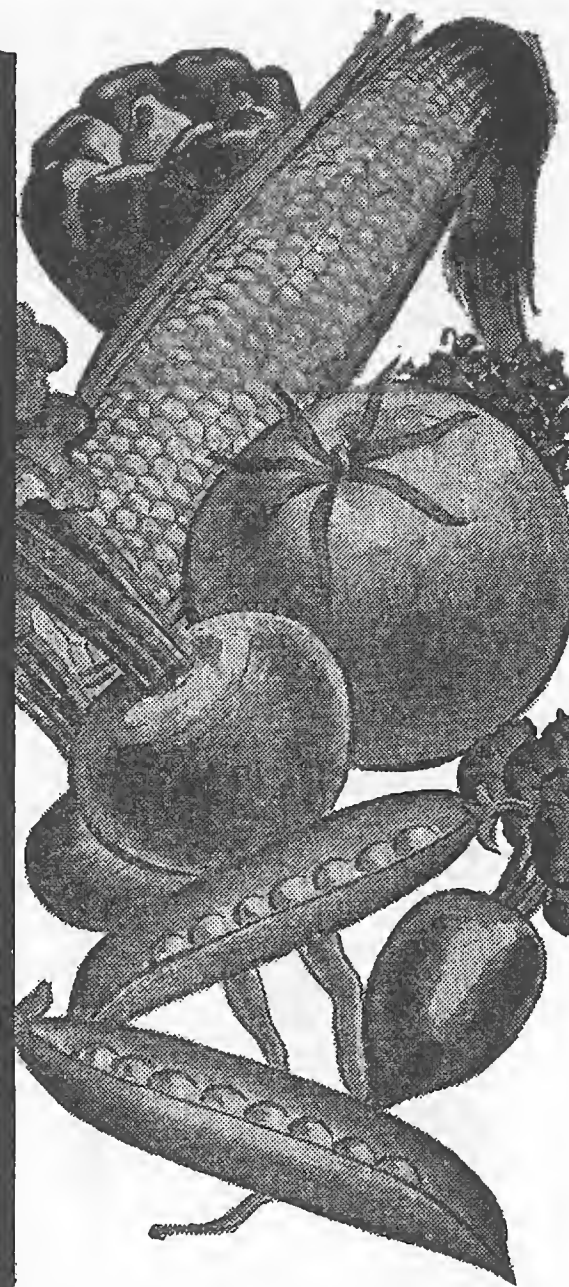
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THE PAN-PACIFIC ENTOMOLOGIST

Published by the
Pacific Coast Entomological Society
in cooperation with
The California Academy of Sciences

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San Francisco, California

1951

THE PAN-PACIFIC ENTOMOLOGIST

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Entered as second class matter, February 10, 1925, at the post office at San Francisco, under act of August 24, 1912.

The Pan-Pacific Entomologist

Vol. XXVII, No. 2

April, 1951

A NEW MOUNTAIN MIDGE FROM CALIFORNIA

(Diptera: Deuterophlebiidae)

WILLIS W. WIRTH

*Bureau of Entomology and Plant Quarantine, Agricultural Research
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The peculiar nematocerous Diptera known as "mountain midges" have excited the interest and curiosity of biologists whenever they have been found. This has by no means been a common occurrence, as evidenced by the fact that the first adults were not known until 1922, when Edwards described the male of *Deuterophlebia mirabilis* from Kashmir at an elevation of 11,000-12,000 feet in some of the highest mountains of the world. In 1924 Pulikovsky described the first known larvae, pupae, and females of an unnamed species from the Altai Mountains in Siberia. Muttkowski (1927) figured a larva from Yellowstone National Park, Wyoming, which probably belongs to a species, *D. coloradensis*, described by Pennak in 1945 from Colorado. Brodsky (1930) described the larva, pupa, and female of *D. mirabilis* from Central Asia. The Japanese species, *D. nipponica*, was first reported by Kitakami in 1929, by Kawamura in 1932, and Yie in 1933, but was not named and fully described until 1938, when Kitakami gave it what is still the most complete study for any known species, based on many specimens of all stages. The same author (*ibid.*) described the larva and pupa of a second species, *D. tyosenensis*, from northern Korea. Pennak (*ibid.*) has very ably summarized the existing knowledge of the family, including references to the collecting of larvae of undetermined species in Convict Creek, Mono Co., California, and Rock Creek, Benton Co., Oregon. Stone (1949) noted the collection of a male pupa of *D. coloradensis* from Peoria Slough, Oregon, but, as will be shown later, his record probably refers to the new species here described. Thus, up to the present time only four species of *Deuterophlebia* have been named, two of which are known from the immature stages only.

During the summer of 1948 the writer had the opportunity to search for deuterophlebiids over a wide area of northern and coastal

California. His hunt was finally rewarded in the mountains near Mount Shasta in the headwaters of the Sacramento River, when he collected large numbers of larvae and pupae in a small rapid mountain stream. After finding the immature stages several hours before dusk, he made a rapid search for adults in the vicinity, but without success, owing partly to lack of time, which also precluded further visits. However, the dissection of male and female imagoes from mature pupae makes possible the description of all stages of this species, and original observations on the biology, although limited, supplement existing knowledge.

NOTES ON THE HABITS OF THE LARVAE. The larvae were collected in Fawn Creek, near its junction with the South Fork of the Sacramento River at about 5,000 feet elevation, about 10 miles southwest of Mount Shasta City, California. The stream is a typical cold mountain creek, several feet wide with riffles several inches deep, cascading over boulders and stones at a 45° slope from the last pockets of melting snow on the slopes 2,000 feet above.

The deutero-phlebiid larvae and pupae were found on the upper surface of smooth rocks, where they seemed to prefer the water line or the splash at riffle areas. They were also found on broad, fairly flat rocks covered with a thin film of very swift water. The larvae spent much time moving the head and anterior portion of the body in an arc from side to side, presumably feeding on particles they scraped off the surface of the rock. Locomotion was in a characteristic zig-zag lateral course, made possible by alternate loosening of anterior and posterior ends of the body, rotating the free end in an arc to the side, and re-attaching. A similar method for blepharicerid larvae has been described by Kellogg (1903). When the larvae are disturbed, locomotion may be surprisingly rapid, especially considering the amount of co-ordination necessary to move several sets of legs at one time, and the hazard of being swept away in the swift current.

The exceedingly simple mechanism of hooks and sucker of the larval prolegs was described and illustrated by Pulikovsky. In looking at her figures, however, the writer has reached a different conclusion regarding the function of this mechanism. It seems that the primary force for secure attachment or adhesion is not the suction of the pad at the end of the leg, but rather the simultaneous traction of the hundreds of minute retrorse hooks on each leg, which is greatest when the leg is relaxed and extended. The primary muscles

of the leg, which are attached at the center of the pad at the end of the leg, would then act by their contraction to invaginate the rows of hooks, the distal rows first, thus shortening the leg and releasing its hold on the substrate preparatory to movement.

Owing to the scarcity of males and male pupae, Kitakami postulates that *D. nipponica* may reproduce by parthenogenesis. The collection of about equal numbers of pupae of both sexes in the California material would indicate normal reproduction. The seasonal distribution of the present species is not known, but the collection of about equal numbers of larvae of all sizes indicates the existence of no marked broods, at least in mid-summer. There are four larval instars, according to Kitakami.

The deutero-phlebiids were closely associated with several other dipterous larvae and pupae of similar body form and similar habit. Individuals of undetermined species of two genera of Blephariceridae, *Agathon* and *Phylorus*, were numerous, usually in deeper water than the *Deuterophlebia*. The psychodid genus *Maruina* was represented in greater abundance, and usually in shallower water or closer to the water line or upper splash line.

The discovery of this colony of *Deuterophlebia* coincided with the adoption of, and can be almost wholly credited to, the use of an apparently crude but nevertheless amazingly effective collecting method, described by Fritz Müller in 1895 for collecting *Maruina* larvae. One need only to pass his fingers, palms down, slowly and with moderate pressure over the rocks where larvae may be suspected of breeding. They are dislodged from the rocks and cling tightly to the skin, where their presence can be readily observed at close range, their color contrasting much more greatly with the hand than with the rocks of their natural habitat. The larvae can then be removed rapidly from the hand by knife or forceps, perhaps in the relative safety and comfort of a nearby boulder rather than at the brink or in the spray of a dangerous stream. More important, hundreds of samples can be taken in the time in which only one would have been possible by conventional screens, seines, or even by direct visual examination of the rocks.

Deuterophlebia shasta Wirth, new species

MALE: Length, undetermined; wing, 3.6 mm. by 1.7 mm. *Head* (fig. 1b) hidden under projecting mesonotum, small, transverse and flat. Eyes small, subspherical, without pubescence, diameter about a fourth entire width of head, projecting at antero-lateral corners of head. Clypeus with small prominent setose mesal lobe. Ocelli and

mouthparts absent; mouth opening on ventral side of clypeal lobe. Ventral margin of head rather flattened. Antennae (fig. 1d) six-segmented, very long, proportions of segments 10:5:16:6:6:560; first two segments enlarged, the first with fine setae; second ring-like, bare; third to fifth each with a small distal tubercle on mesal side bearing five to six peg-like hyaline sensillae; distal segment evenly tapered to filiform tip, with minute capitate sensillae on mesal surface of about proximal half.

Thorax robust, apparently devoid of vestiture. Prothorax much reduced, mesonotum very convex in front, broad and dorsally flattened caudad; scutellum flat and about four times as broad as long; postscutellum very large, as broad as mesonotum; metanotum triangular, hidden under first two abdominal tergites. Pleural structure not determined. Halteres grayish hyaline, with minute pubescence, the stem slender, knob subspherical.

Wing hyaline, with fine microtrichiae; with shape and apparent venation as in figure 1e; only costa, subcosta, and R_1 apparently thickened; the fan-like arrangement of secondary venation due to folding of the wing in the pupal case, this first pleat-like lengthwise, the whole then alternately folded in four sections.

Legs long and slender, proportions of mid legs as in fig. 1h, fore and hind legs similar; coxae and trochanters setose ventrally, the trochanters apparently two-segmented; femora with a few dorsal setae; tibiae and tarsi with well-developed ventral pubescence of fine capitate hairs; tibial spurs absent; tarsal segments obliquely articulated; last segment (fig. 1i) with claws unequal, reduced to lanceolate pubescent lobes, the empodium a flattened disc, nearly circular, the diameter subequal to length of fifth segment, the surfaces densely set with long very fine capitate hairs.

Abdomen broad at base, tapered distad to eighth segment which is greatly reduced and only half as broad as the genitalia. Sixth and seventh segments with low lateral prominences each bearing five or six strong, scattered spines. *Genitalia* (fig. 1j) simple, ninth tergite bilobed, extending between the basistyles about half their length, deeply emarginate mesad, each lobe with a pair of short blunt spines; ninth sternite poorly differentiated. Basistyles tapering, mesal surface with fine setae; dististyles simple, about half as long as basistyles, slightly tapered distad, flexor surface slightly concave and set with scattered short spinose setae. Aedeagus tube-like, slightly tapered caudad, arising between bases of basistyles, the rounded tip reaching their apices; apparently with a slightly sclerotized inner protrusible penis tube.

FEMALE: In general similar to the male, with the following differences: *Head* (fig. 1a) smaller than in male, with antennae (fig. 1c) short, segments in proportion of 27:10:30:10:10:18; the four flagellar segments at apices with one, three, three, and three, peg-like hyaline sensillae respectively; distal segment also with two mesal and one distal, short setae. *Legs* (fig. 1g) with femora much

stouter than in male; femora and tibiae with a few minute setae on extensor surface; tarsal segments with one or two pairs of small ventral spines, the articulations very oblique, segments two to four appearing rhomboidal; segment five with claws (fig. 1f) strong, equal, and simple, with basal swelling, empodium lanceolate, with short setae. *Abdomen* tapering to tip, with minute pubescence; seventh segment with single lateral bristle; eighth with irregular lateral lobe with about six short strong bristles; tenth tergite bilobed. Eighth sternite with a large conical invaginated genital chamber extending forward from the gonopore in middle of hind margin; ninth sternite bilobed, tenth sternite a pair of blunt pubescent lobes with a blunt smooth tubercle on mesal side of apices.

PUPA: *Length* variable, about 2.0-2.5 mm. Broadly oval, dorsal surface (figs. 2a, f) convex, especially in head region, flattened behind, integument strongly sclerotized dark brown, with strong gran-

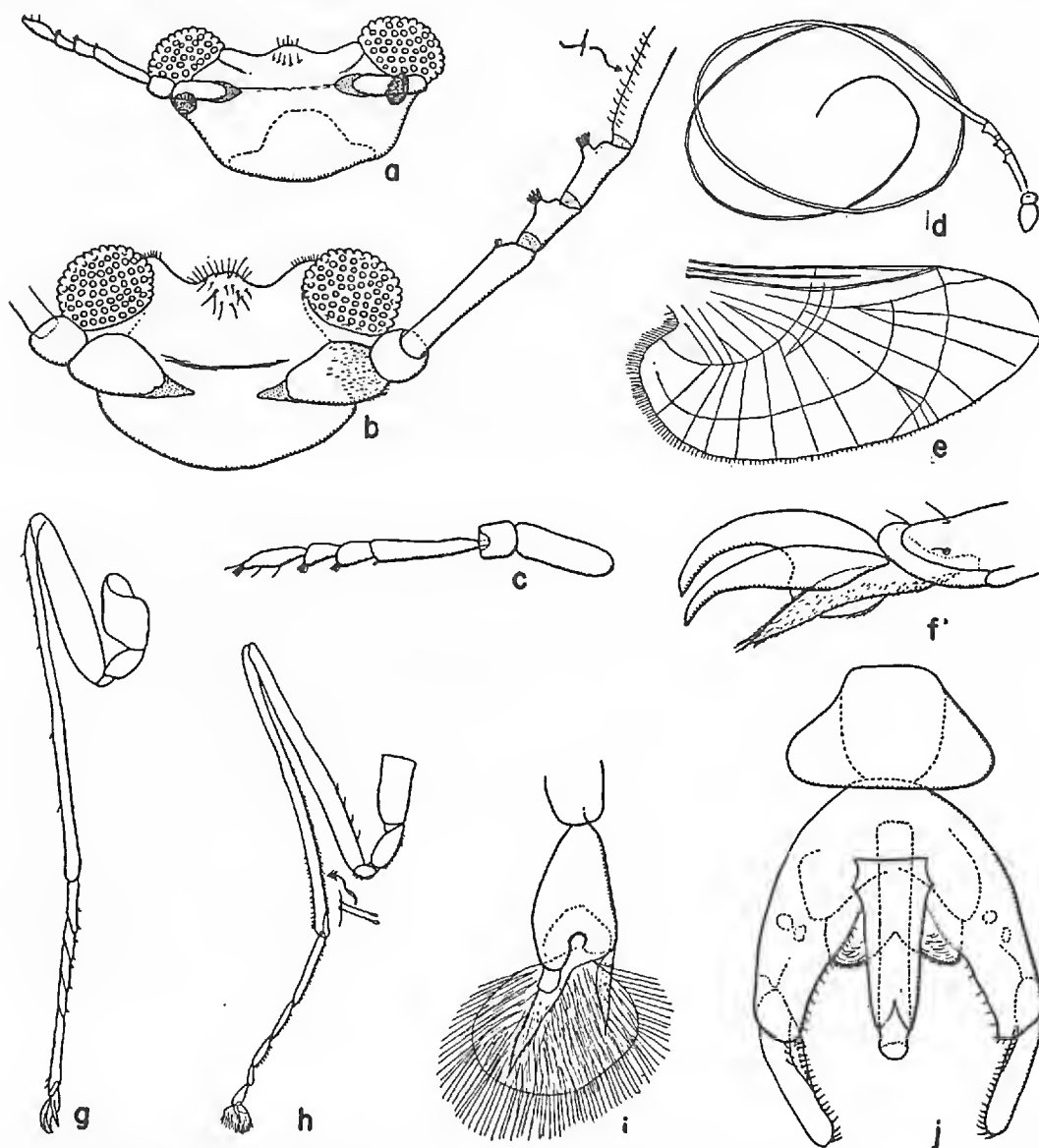


Figure 1. *Deuterophlebia shasta*. a. head, female; b. head, male; c. antenna, female; d. antenna, male; e. wing, male; f. fifth tarsal segment, female; g. mid-leg, female; h. mid-leg, male; i. fifth tarsal segment, male; j. genitalia, male, ventral aspect.

ulation especially on caudal margins of segments. Pro- and mesothorax fused, with median longitudinal seam (which splits at emergence of imago). A pair of prominent respiratory horns on anterolateral margin, each with a short thick stem and three very crooked filaments; a single long, stout spine arising from a conical tubercle dorsad of base of each respiratory organ; dorsal surface of body between these spines with a pair of long, transverse, sub-lateral lines of dark macro-granulation. Examination of the histoblasts in mature larvae shows that the respiratory organ is prothoracic, and the spine is mesothoracic. *Metanotum* small, not reaching lateral margins, with a pair of transverse lines of granulation similar to but shorter than those on mesonotum. First and second abdominal segments very narrow with ends curved forward, projecting free as very heavily sclerotized prominences with about a dozen strong black thorn-like spines. Segments three to five with undulating margins, sixth segment with five to six spines on caudo-lateral margin, mostly on ventral side; seventh segment with spinose caudo-lateral lobes bent around the small mesal eighth and ninth segments. Dorsally the male pupa distinguishable from the female by the much longer thoracic region (0.36 of the entire length in male; 0.27 in female).

Ventral surface (figs. 2*b*, *g*) flattened, not heavily sclerotized, with three pairs of blackish oval adhesive pads near lateral margins of abdominal segments three to five. Sexual dimorphism extreme on ventral aspect; male with the long antennal cases each forming two elliptical rings appressed around body; female antennal cases short, not reaching past wing cases; the latter reaching to fourth abdominal segment; leg cases reaching fifth segment in female, seventh in male.

MATURE LARVA (fig. 2*e*): Length variable, about 3.5 mm. Color yellowish-white, with some scattered orange pigment along dorsum, head and base of antennae dark brown. Body plano-convex; eleven-segmented, counting the head, the three thoracic segments, and seven leg-bearing abdominal segments; without trace of spiracles.

Head rather flat, clypeus well differentiated, with four lateral pairs of minute setae, two lateral pairs of setae well back on frons and about four pairs of multiple-branched setae near base of each antenna. Antenna arising from a short conical tubercle, proximal segment brownish sclerotized, two-thirds as long as width of head, stout, slightly tapering; bifurcating into a long dorsal and a short ventral, membranous branches, respectively about twice as long and three-fourths as long as proximal segment. A pair of small black eye-spots near lateral margin of head behind antennae.

Mouthparts (fig. 2*h*): Labrum membranous, bilobate, projecting in front of, and curving down below clypeus to ventral surface of head, with a pair of densely setose ridges curving from lateral corners in front to near mid-line on caudo-ventral margin of labrum; sides of labrum with series of short, plate-like setae. Mandibles with a heavily sclerotized ring, bearing a narrow transverse comb of brown setae, and a dense tuft of long brown hairs on caudo-mesal

margin. Maxillae a transverse lobe with a comb-like row of dense short setae, a small palpus on caudal margin near lateral ends and a small black granular spot on caudal margin near mid-line. Labium apparently a submedian pair of sclerotized flaps.

Thorax with three well-marked segments, the mesothorax broadest and most highly pigmented.

Abdomen broadest at segment four, each of the seven preapical segments with a well developed lateral pseudopod or proleg, each bearing a distal series of eight to eleven rows of small dense black hooks (fig. 2c). Front and hind margins of prolegs with dense vestiture of long, multiple-branched black hairs. Each segment dorsally with a few fine setae in a transverse row. Eighth segment consisting of a pair of tapering curved lobes, bearing a pair of black peg-like spines and a hair at apex (fig. 2d); on ventral side with five white, sausage-shaped, anal gills.

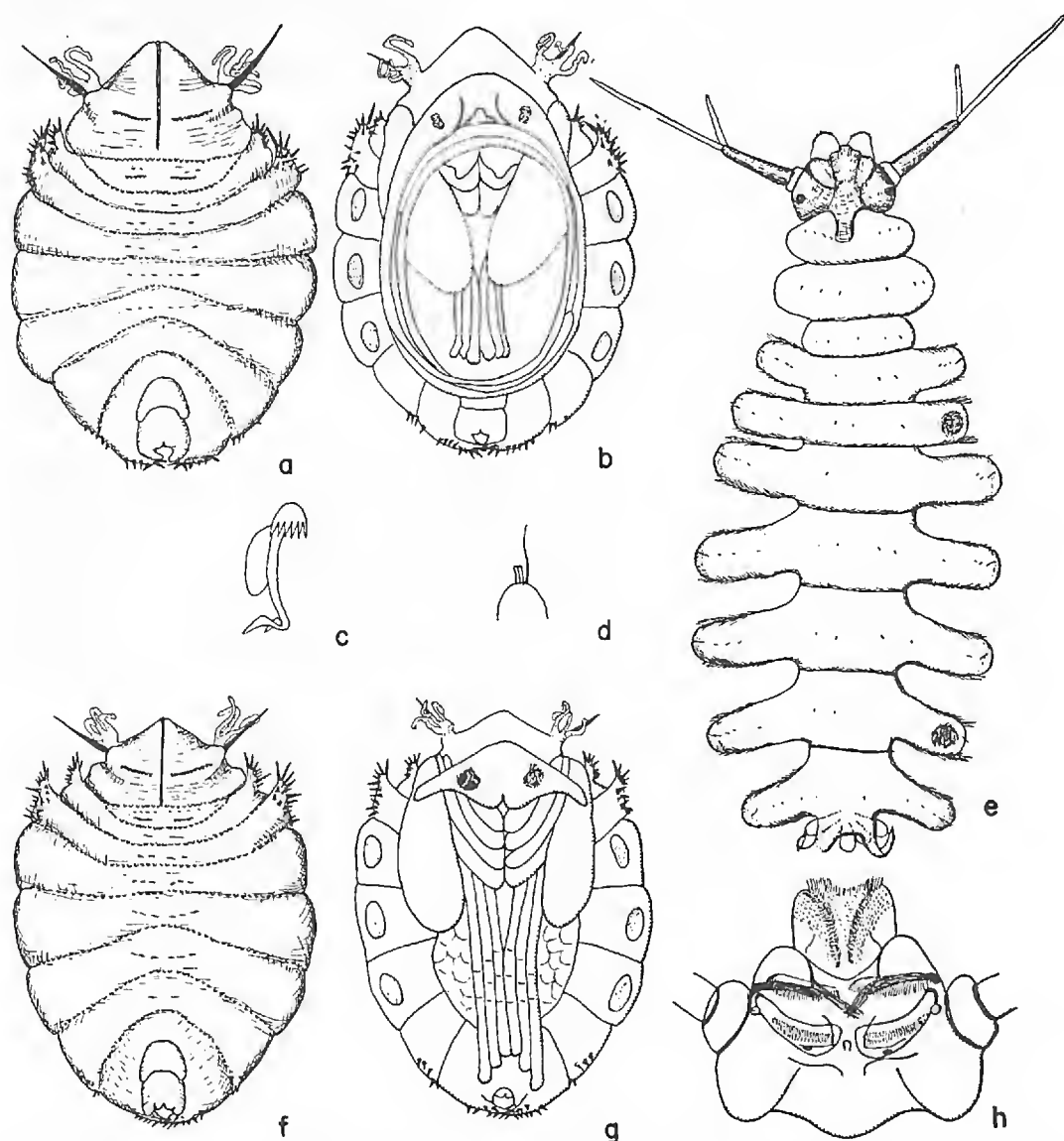


Figure 2. *Deuterophlebia shasta*. a. male pupa, dorsal view; b. same, ventral; c. detail of hook of larval proleg; d. detail of tip of eighth abdominal segment of larva; e. mature larva, dorsal view (hooks of second and sixth prolegs, right side, inverted); f. female pupa, dorsal view; g. same, ventral; h. larval head, ventral view showing mouth parts.

Holotype male, dissected from pupa, FAWN CREEK, near headwaters of South Fork, Sacramento River, SISKIYOU COUNTY, CALIFORNIA, July 22, 1948, W. W. Wirth. (TYPE No. 59,374, U. S. National Museum) *allotype* female; *paratypes* 2 males, 1 female dissected from pupae; 25 pupae and 100 larvae in various stages, same data as type. Adult paratypes will be deposited in the California Academy of Sciences and the British Museum of Natural History.

COMPARATIVE NOTES. The species of *Deuterophlebia* are difficult to separate in the larval and adult stages because of poorly diagnostic characters. However, the pupae are quite distinctive and Pennak has given a key to separate them. *D. shasta* falls in couplet two of Pennak's key with Pulikovsky's Altai Mountain species on the basis of the single long thoracic spine near the respiratory organ. From her species it may be separated as follows:

Pupa with distinct transverse granulose lines on dorsum of thoracic segments; larvae yellowish to light orange in color; adult female antenna with two pre-apical setae on last segment.....	<i>shasta</i>
Pupa without differentiated lines on dorsum of thorax; larvae dark brown on dorsal surface; adult female antenna with at least five pre-apical setae on last segment.....	(Pulikovsky's species)

The pupa reported by Stone (1949) from Oregon as *D. coloradensis* is in the U. S. National Museum collection and has been examined by the writer. It possesses the single pair of thoracic spines. The range of *shasta* doubtless extends over a much wider area along the Pacific Coast while that of *coloradensis* remains within the Rocky Mountain system so far as known.

The writer wishes to thank Dr. R. W. Pennak of the University of Colorado for the gift of larvae and pupae of *D. coloradensis*. Pupae of the two Japanese species in the National Museum collection were also studied.

LITERATURE CITED

BRODSKY, K.

1930. Zur Kenntnis der Wirbellosenfauna der Bergströme Mittelasiens. II. *Deuterophlebia mirabilis* Edw. Zeitschr. Morph. Okol. Tiere, 18:289-321.

EDWARDS, F. W.

1922. *Deuterophlebia mirabilis*, gen. et sp. n., a remarkable dipterous insect from Kashmir. Ann. Mag. Nat. Hist., ser. 9, 9:379-387.

KAWAMURA, T.

1932. *Deuterophlebia*. Iconographia Insectorum Japonicorum, p. 2204.

KELLOGG, V. L.

1903. The net-winged midges (Blepharoceridae) of North America. Proc. Calif. Acad. Sci., ser. 3, 3:187-232.

KITAKAMI, S.

1929. An unusual insect from Japan (Diptera Deuterophlebiidae) Zool. Mag., 41:379-380.
1938. The Deuterophlebiidae of Japan. Annot. Zool. Japon. 17:487-513.

MULLER, F.

1895. Contribution towards the history of a new form of larvae of Psychodidae from Brazil. Trans. Ent. Soc. Lond., 1895: 479-482.

MUTTKOWSKI, R. A.

1927. A new and unusual insect record for North America (Diptera-Deuterophlebiidae). Bull. Brooklyn Ent. Soc., 22:245-249.

PENNAK, R. W.

1945. Notes on mountain midges (Deuterophlebiidae) with a description of the immature stages of a new species from Colorado. Amer. Mus. Novitates, No. 1276, pp. 1-10.

PULIKOVSKY, N.

1924. Metamorphosis of *Deuterophlebia* sp. (Diptera, Deuterophlebiidae Edw.). Trans. Ent. Soc. London, 1924:45-62.

STONE, A.

1949. *Deuterophlebia coloradensis* Pennak in Oregon (Diptera, Deuterophlebiidae). Proc. Ent. Soc. Wash., 51:122.

YIE, S.

1933. Observations on a Japanese *Deuterophlebia* (Diptera). Trans. Nat. Hist. Soc. Formosa, 23:271-296.

HABITATS OF SPECIES OF NOVELSIS

(Coleoptera: Dermestidae)

Mature larvae of *Novelsis horni* (Jayne) were taken on Dec. 27, 1950, one by the writer from a *Sceliphron* nest 5 miles north of Tucson, Arizona, and one by C. B. Beal from a Leptochiline-like nest in the sandy bank of the Santa Cruz River 9 miles south of Tucson. A single mature larva of *Novelsis varicolor* (Jayne) was found by the writer in a *Sceliphron* nest 11 miles northeast of Tucson on December 28. All the larvae were reared to adults on pollen in a temperature cabinet at 31° C.—R. S. BEAL, JR.

A NEW GENUS OF MELOIDAE FROM
NORTH AMERICA

J. W. MACSWAIN

University of California, Berkeley

In North America the genus *Lytta* has long been recognized as being made up of several well defined species groups. Horn (1873)¹ in his synopsis of the genus first suggested such a division and he was followed by Fall (1901)² and others as additional species were described. However, larval studies coupled with field observations and a re-evaluation of the significance of adult structures clearly indicate that the genus as now recognized is polyphyletic. The species which have previously been assigned to Group 3 of Horn's classification can now be shown to be an annectant group whose features relate them more closely to *Epicauta* than to *Lytta*.

Genus *Linsleya*³ new genus

Antennae with segments compressed, intermediate segments either sub-quadrate or transverse. Legs with front tibia sericeous on its inner face; hind tibial spurs equal, slender and acute.

Type: *Lytta convexa* LeConte.

In addition to the type, the following species are assigned to this genus on the basis of the adult characters; *L. sphaericollis* Say, *L. compressicornis* (Horn), *L. infidelis* (Fall) and *L. suavissima* Wellman.

The genus as here defined should be placed as a primitive group of the Epicautini. Such an assignment requires a modification of the present definition of this tribe, as based on the adults, to include members lacking a sericeous patch on the anterior femora but possessing such a patch on the anterior tibia. No modification of the tribal definition is necessary for the inclusion of the larvae, although only the first instar larva of *L. convexa* is known at the present. Finally it may be stated that the activity pattern of the adults of several species has been observed by the author to be more typically Epicautine than Lyttine.

¹Horn, G. H. 1873. Revision of the species of several genera of Meloidae of the United States. Proc. Am. Phil. Soc. 13:88-117.

²Fall, H. C. 1901. Notes on *Dichelonycha* and *Cantharis*, with descriptions of new species in other genera. Tran. Am. Ent. Soc. 27:277-316.

³Named in honor of E. G. Linsley in partial recognition of his many contributions toward a knowledge of the biology and systematics of the Coleoptera.

THE SPINOSE EAR TICK IN WASHINGTON¹E. P. BREAKEY² AND HAROLD PROPP³

Ticks collected from the ears of cattle on the A. D. Olson Ranch near Beverly, in central Washington, in November, 1949, were referred to the senior author's attention on February 8, 1950. They were tentatively identified as the spinose ear tick, *Otobius megnini* (Dugès). Immediately, specimens were sent to Dr. F. C. Bishopp, Assistant Chief, Bureau of Entomology and Plant Quarantine, who verified our determination.

Dr. Bishopp stated (*in litt.*), "It is unusual to have a general infestation of this tick as far north as Beverly, Washington, although it has been taken on several occasions in the state of Washington."

Dr. Bishopp also asked if any of the cattle on the ranch had been brought in from the south, since the species is native to the southwestern United States.

In the meantime, Dr. M. O. Barnes, Supervisor, Division of Dairy and Livestock, Washington State Department of Agriculture, Olympia, had been questioned regarding the presence of the spinose ear tick in Washington. Dr. Barnes stated (*in litt.*), "Several years ago, I had an opportunity to investigate severe tick infestation in the ears of cattle in eastern Washington; however, it was doubted at that time if the tick could be identified as the spinose ear tick."

When A. D. Olson, owner of the cattle, was questioned regarding the history of the infestation, he stated (*in litt.*), "We have been running livestock in this locality for 20 years. We have been running cattle for the last five years and sheep fifteen years prior to that. We have not shipped in any stock from any southern states. We have always had ticks here but the ear tick has been bothering us only about two years. The ear tick infestation was heavier this year than in previous years. We did not examine the sheeps' ears as they did not give us trouble, but we have always found them in the dogs' ears."

David H. Brannon, Extension Entomologist, State College of Washington, believes that the spinose ear tick has been present in central Washington for a number of years. Recently, he displayed

¹Scientific Paper No. 973, Washington Agricultural Experiment Stations, Institute of Agricultural Sciences, State College of Washington, Pullman.

²Associate Entomologist, Western Washington Experiment Station, Puyallup.

³Veterinarian, Bureau of Animal Industry, U. S. Department of Agriculture.

some specimens of this tick which he had mounted in plastic for the purpose of acquainting county agents and ranchers in the area with the appearance of the pest. A few days later, Brannon wrote as follows: "In going over our insect identification record in the office, I find that Laurel Smith (Brannon's predecessor) reported the spinose ear tick on September 3, 1942. The identification was made by Dr. Roy D. Shenefelt. The ticks were collected from cattle near Quincy. They were sent to Laurel Smith by D. Sinclair through L. R. Nicholson from Ellensburg. Smith states that four cattle had died from the effects. Smith also notes, "This is the first record I know of from this state. It has been recorded from Alberta. Insect Pest Survey has been notified and any records of previous infestations from the state requested." This is the only record we have in our files on the spinose ear tick other than the specimens I showed you when I was in Puyallup."

The specimens sent to Dr. Bishopp for identification were slightly engorged nymphs. It appears that we are dealing with an infestation that is of several years standing. Apparently the ticks pass the winter in central Washington as nymphs in the ears of the host, multiplication and dispersal taking place during the summer. It is not surprising that a southern species with such habits should be able to survive in more northern localities, since temperature changes on the host during the winter would not be great.

Bishopp and Trembley (1945) state "It is unlikely that *Ornithodoros megnini* will ever become permanently established or assume such importance as a livestock pest in states to the east of Texas or to the north of Oklahoma, New Mexico, Arizona, and California, with the possible exception of certain parts of southern Colorado, Utah and Nevada." Certain exceptions to this generalization are then given.

This tick was also collected by J. D. Gregson in December, 1943, in the ears of mountain goat at Bryant Creek, British Columbia. Since a nymph was taken from the ear of a cat in the same vicinity (Ewings Landing on Okanagan Lake, B. C.) on October 6, 1941, it also appears that the pest may be established there, at least temporarily.

LITERATURE CITED

- BISHOPP, F. C., and TREMBLEY, HELEN LOUISE
1945. Distribution and Hosts of Certain North American Ticks, *Journal of Parasitology*, 31:44-46.

RECORDS AND DESCRIPTIONS OF
MEGACHILID BEES FROM TEXAS
(Hymenoptera)

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In previous papers¹ the thesis was developed that several groups of megachilid bees are confined to the westernmost deserts of North America, immediately east of the great mountain divides of central and southern California. This idea was based on extensive collecting in California and some collecting in Arizona by the author, Timberlake and others, and extensive collecting in New Mexico and Colorado by Cockerell. Of particular importance were Cockerell's collections from southern New Mexico, made in desert areas similar in many ways to the Californian deserts. His material lacked the groups involved.

In the spring of 1949 the author, in company with his wife and Doctor and Mrs. R. H. Beamer, spent a week collecting in western Texas and obtained in these easternmost North American deserts members of several groups once thought to be confined to the western desert or at least concentrated there. Such groups are *Anthocopa* of the subgenera *Phaeosmia* and *Eremosmia*. There remain several of the groups (e. g. *Proteriades* and two subgenera of *Ashmeadiella*) which are probably actually confined to the far west, but further collecting will be necessary to establish this. It becomes obvious that Cockerell's collecting in southern New Mexico was not sufficiently extensive to be used as a basis for zoogeographic generalizations, at least in connection with bees which fly in the spring.

Except as otherwise stated types of new forms are deposited in the Snow Entomological Collections, University of Kansas.

ANTHOCOPA (PHAEOSMIA) RUBRELLA Michener, 1949

It is now certain that the flowers on which the type series of this species were taken at Dryden, Texas, were a species of *Dalea*.

Additional records, all from Texas, are as follows: Marathon, April 13, 1949, on *Dalea argyraea*; Cooper's Store, Big Bend Na-

¹ Michener, C. D., 1939, A revision of the genus *Ashmeadiella* (Hymen., Megachilidae), Amer. Midland Nat., 22:1-84; 1943, The American bees of the genus *Anthocopa* with notes on Old World subgenera (Hymenoptera, Megachilidae), Ann. Ent. Soc. Amer., 36:49-86; 1944, The distribution of the osmiine bees of the deserts of North America, Amer. Nat., 78:257-266.

tional Park, April 11, 1949, on *Dalea neomexicana*; Sanderson, April 13, 1949, on *Dalea formosa* (all collected by R. H. Beamer and C. D. Michener).

The Sanderson series of two males and two females is interesting in that one specimen of each sex is entirely without red on the abdomen, and in the remaining female the red is very dark, particularly on the third metasomal tergum. The remaining male is fully as red as specimens from other localities. The absence of red in part of this series is possibly an intergradation toward *A. maryae*, but the clypeal margin is typical of *rubrella*.

ANTHOCOPA (PHAEOSMIA) MARYAE Michener, 1949

Three females, Quemada, Texas, on *Dalea pogonathera*, April 14, 1949, (R. H. Beamer, C. D. Michener.)

Anthocopa (*Phaeosmia*) *daleae* Michener, new species

This species, which raises the total number of known species of *Phaeosmia* to ten, resembles *rubrella* and *maryae* in the broad apical flange of the sixth metasomal tergum of the female, but differs from them as well as from all other species of *Phaeosmia* by having a strong longitudinal median carina on the clypeus and by having the apical margin of the clypeus feebly trilobed (fig. 7), the lobes being the angles which demark the truncation and a median convexity between them. The male differs from that of *rubrella* in the large second metasomal sternum, which reaches the seventh tergum when the abdomen is in repose. In the key to the males of *Phaeosmia* (Michener, 1949, Jour. Kansas Ent. Soc., 22:54) *daleae* runs to *enceliae* if the rounded rather than emarginate second sternum is ignored.

Female: Length 6 mm. (varying to 5.8 among paratypes). Black, pubescence dull white, ochraceous to light fuscous on lower half of clypeus and dorsum of head and thorax; tufts of hair beneath clypeal margin orange but very small, not exceeding clypeal margin; face rather densely pubescent to above level of antennae; mesepisterna and marginal portions of scutum and scutellum rather densely pubescent. Inner margins of eyes converging below. Punctuation of head and thorax rather uniform and coarse, that of area immediately in front of anterior ocellus finer and dense, that of lower two thirds of clypeus also fine and dense except for the longitudinal median raised carina which marks this part of clypeus; lower end of carina low and narrow, upper end merging into rather coarsely punctate upper third of clypeus; clypeal truncation with impunctate but not thickened margin which is brownish; truncation longer than distance from its end to lateral angle of clypeus; median portion of

truncation slightly convex; distance between posterior ocelli slightly greater than distance from one of them to eye margin or to posterior edge of vertex; median ocellus about 1.5 times as far from antennal bases as from posterior edge of vertex; genal areas narrower than eye seen from side. Mandibles feebly dark red subapically, less than three times as long as greatest breadth, over three times as long as narrowest medial breadth, distance between first and second teeth less than that between second and third, margin between first and second teeth a V-shaped notch, that between second and third arcuate, subapical inner swelling absent; maxillary palpi longer than greatest width of galea, five-segmented, second segment longest, first and third subequal, slightly shorter, fourth slightly shorter than third, fifth very small and slender; first segment of labial palpus about 0.7 times as long as second. Thoracic punctation similar to that of vertex; tegulae smooth, translucent dark testaceous. Legs black, tibial spurs pale brown. Wings slightly dusky, veins and stigma black. Abdomen black, posterior margins of terga feebly brownish; metasomal terga one to four with conspicuous apical bands of white pubescence, somewhat narrowed medially on first and second terga; sixth tergum somewhat pruinose, more finely and closely punctured than dorsal portions of first four terga; sixth tergum with apical flange, projecting at an angle to disc of tergum; scopa short, dull white, that of apical half of sixth metasomal sternum consisting of hairs which are bent subapically.

Male: Length 5.5 mm. (varying to 5.2 mm. among paratypes). Similar in appearance and punctation to female but punctures of entire clypeus and supraclypeal area fine and dense, those in front of anterior ocellus not so; face more densely covered with white pubescence; clypeus without longitudinal carina, margin transverse, coarsely denticulate, median portion with three large denticles, adjacent parts of margin with two denticles on each side. Mandibles bidentate, outer tooth the longest. Abdominal punctation and pubescence similar to that of female; sixth metasomal tergum with a narrow projecting flange produced to a median slightly obtuse angle and to a small rounded lobe at each side; seventh tergum small, brown, margin rounded laterally, straight medially; first sternum thickened, posterior margin straight; second sternum large, covering succeeding sterna, posterior margin broadly rounded, reddish brown; third sternum with a broad squarely cut emargination with a fringe of long hairs only medially; fourth to sixth sterna entire, broadly rounded, margin of fifth more clearly straight than others; seventh sternum with apical emargination; eighth with apex obtuse.

Holotype female, *allotype* male, and three female and two male *paratypes*: COOPER'S STORE, BIG BEND NATIONAL PARK, TEXAS, on *Dalea neomexicana*, April 11, 1949 (R. H. Beamer, C. D. Michener). One female is from *Phacelia popei* but was not collecting pollen. One female *paratype*: Sanderson, Texas, on *Dalea formosa*, April 13, 1949 (R. H. Beamer, C. D. Michener).

This is the third Texan species of *Phaeosmia*. All are smaller than the more western species of this subgenus, but *daleae* in particular is closely related to the western group of species.

Anthocopa (*Eremosmia*) *beameri* Michener, new species

This is a species of typical *Eremosmia*, a group of bees hitherto known only from the California deserts. It has the appearance of a small specimen of *A. robustula* (Cockerell), from which it differs strikingly in the more nearly equidistant mandibular teeth of the male, in the coarsely punctured clypeus of the female with the upper portion shining, convex, with widely separated punctures, and in the rounded subapical inner mandibular swelling of the female. Because of the swollen upper part of the clypeus, the female might run to *laevibullata* in the key (Michener, 1943, Ann. Ent. Soc. Amer., 36:67). It differs from that species by the equidistant mandibular teeth of the female, among many other characters.

Female: Length 6.5 mm. (varying to 7.0 mm. among paratypes). Black, pubescence dull white, ochraceous on dorsum of head and thorax, tufts of hair beneath clypeal margin large, orange; sides of face and supra-antennal area rather densely pubescent to level of median ocellus, sides and dorsum of thorax also rather densely pubescent. Inner margins of eyes parallel. Punctuation of head and thorax fine and dense, the vertex and supra-antennal areas particularly so; supraclypeal area more coarsely and sparsely punctate, especially below; clypeus with upper two thirds strongly bulging, coarsely punctured, with punctures widely separated especially medially where there is a longitudinal zone which is impunctate or nearly so; lower third of clypeus closely and rather finely punctate except for the impunctate, thin margin of the truncation; margin of truncation slightly shorter than distance from end of truncation to lateral angle of clypeus, angles demarking truncation rounded; distance between posterior ocelli subequal to distance from one of them to posterior margin of vertex and to eye margin; anterior ocellus with its anterior margin slightly nearer to antennal bases than to posterior edge of vertex; genal areas narrower than eyes seen from side. Mandibles dark red subapically, less than 2.5 times as long as greatest breadth, less than four times as long as shortest (medial) breadth, teeth large, their apices equidistant, inner subapical swelling rounded; maxillary palpi about as long as greatest width of galea, four-segmented, second segment longest, third and fourth slightly shorter; first segment of labial palpus about 0.6 times as long as second. Punctuation of mesoscutum coarser than that of vertex, that of mesepisternum still more so; tegulae smooth, transparent testaceous. Legs black, tibial spurs brown. Wings slightly dusky, veins and stigma black. Abdomen black, posterior margins

of terga brownish, metasomal terga one to four with broad apical bands of white pubescence; sixth tergum and posterior portion of fifth pruinose; punctation fine, dense on fifth and sixth terga but sparser on others; scopa short, dull white.

Male: Length 6.5 mm. (6.0 to 6.8 mm. among paratypes). Similar in appearance and punctation to female but punctation of clypeus very fine and dense, face more densely covered with white pubescence; clypeal margin but little produced, edentate, slightly thickened and shining; inner orbits strongly diverging below. Mandibles tridentate, inner tooth much shorter than the others. Sixth metasomal tergum with posterior margin convex, with weak lateral lobes; seventh largely hidden, brown, margin with median notch. First sternum with posterior margin straight, second large, margin broadly rounded except for shallow, broad, median apical emargination, reaching to cover all but the apex of the fourth sternum; third sternum hidden, with broad, deep emargination which bears a fringe of long hairs medially; fourth sternum broadly rounded posteriorly, covering following sterna; sixth with small median notch in posterior margin; seventh with posterior margin broadly emarginate.

Holotype female, *allotype* male, and twenty-one male *paratypes*: COOPER'S STORE, BIG BEND NATIONAL PARK, TEXAS, on *Phacelia popei*, April 11, 1949 (R. H. Beamer, C. D. Michener); four female *paratypes*, twenty miles south of Marathon, Texas, on *Nama hispidum*, April 12, 1949 (R. H. Beamer, C. D. Michener).

This species is named for Doctor R. H. Beamer who helped collect the type series, in addition to many other interesting bees from Texas, Kansas, and elsewhere.

ASHMEADIELLA (ASHMEADIELLA) BUCCONIS DENTICULATA
Cresson, 1878

Cooper's Store, Big Bend National Park, Texas, April 11, 1949, (R. H. Beamer, C. D. Michener).

ASHMEADIELLA (ASHMEADIELLA) PROSOPIDIS (Cockerell), 1897

Hot Springs, Big Bend National Park, Texas, on *Prosopis juliflora*, April 11, 1949 (C. D. Michener, R. H. Beamer).

ASHMEADIELLA (ASHMEADIELLA) MELILOTI MELILOTI
(Cockerell), 1897

Sanderson, Texas, on *Dalea formosa*, April 13, 1949 (R. H. Beamer and C. D. Michener); Quemada, Texas, on *Dalea pogonathera*, April 14, 1949 (R. H. Beamer and C. D. Michener).

ASHMEALIELLA (ASHMEADIELLA) CACTORUM CACTORUM
(Cockerell), 1897

Twenty-five miles southeast of Dryden, Texas, on *Dalea argyraea*, April 13, 1949 (R. H. Beamer and C. D. Michener); Quemada, Texas, on *Dalea pogonathera*, April 14, 1949 (R. H. Beamer and C. D. Michener).

ASHMEADIELLA (ASHMEADIELLA) GILLETTEI Titus, 1904

Specimens of this species from western Texas and southern New Mexico are intermediate between the Great Plains form, *gillettei* (for which the synonym *coloradensis* was used by error in Michener, 1949, Jour. Kansas Ent. Soc., 22:45), and the form previously known as *A. rufiventris* Michener from the arid parts of California and Baja California. It is evident that *rufiventris* should be considered a subspecies of *gillettei*, and that a new subspecific name (*rubra*) should be proposed for the Texan population. The geographical variation can be described as follows:

Specimens from the plains east of the foot of the Rocky Mountains (Boulder and vicinity and Fort Collins, Colorado) and the single known specimen from South Dakota (Badlands National Monument) are rather coarsely punctate, with the mesocutum more coarsely punctate than the vertex. They are wholly black, or in less than half of the population at Boulder (the southernmost of the known great plains localities), there is red on the first two or three metasomal terga and on the posterior femora. This great plains population is properly known as *A. gillettei gillettei*.

Specimens from western Texas and southern New Mexico are about as coarsely punctate as is true *gillettei* but the abdomen is almost wholly red above, the posterior femora are red and the tibiae partly so. This population is to be known as *A. gillettei rubra*.

The populations from the deserts of California and Baja California are similar in coloration to *rubra* although often with more black on the apical portion of the abdomen. They differ from *rubra* particularly by the somewhat finer punctation, that of the mesoscutum being little if any coarser than that of the vertex. This subspecies is *A. gillettei rufiventris*.

A. gillettei ranges westward into the driest parts of cismontane southern California where it is represented by a population similar to *rufiventris* but having more black on the abdomen. In order to name this subspecies in connection with other forms of *gillettei*,

it is described below as *A. gillettei cismontanica*, even though it is not from Texas.

Ashmeadiella (*Ashmeadiella*) *gillettei rubra*

Michener, new subspecies

Female: Similar to typical *gillettei* but metasomal terga red except for dusky area on sixth, sterna largely red except for fifth and sixth which are black, posterior femora red and posterior tibiae red except for outer surface. Length 5 mm.

Male: Coloration similar to female but with median black areas on fifth and sixth terga (in some paratypes these terga black except for sides and posterior margins and median black areas present on third and fourth terga). Length 5 mm. (varying to 5.5 mm. among paratypes).

Holotype female: SANDERSON, TEXAS, on *Dalea formosa*, April 13, 1949 (R. H. Beamer, C. D. Michener). *Allotype* male and eight male *paratypes*: Rankin, Texas, April 10, 1949 (R. H. Beamer, C. D. Michener). These specimens were taken on the ground.

Additional male specimens, one from each locality, are from El Paso, Texas, April 6, 1902, and Mesilla Park, New Mexico, May 6, 1909.

Ashmeadiella (*Ashmeadiella*) *gillettei cismontanica*

Michener, new subspecies

Female: Similar to the subspecies *rufiventris* but with tegulae darker; hind tibiae usually with red on under surface only; first metasomal tergum red (or dusky along posterior margin in some paratypes); second and third terga red, black middorsally (or second wholly red); fourth and fifth terga red, only laterally (fourth sometimes with as much as lateral thirds red, fifth sometimes wholly black); sixth tergum black. Length 4.8 mm (to 5.9 mm.)

Holotype female and ten female *paratypes*: one and one-half miles west of PERRIS, CALIFORNIA, on *Heliotropium oculatum*, May 29, 1946 (P. H. Timberlake). One female *paratype*, same locality and collector, May 14, 1948, on *Cryptantha intermedia*. One female *paratype*, four and one-half miles west of Perris, California, on *Hugelia virgata*, May 14, 1948 (P. H. Timberlake).

The holotype and ten paratypes will be returned to the Timberlake collection, Citrus Experiment Station, Riverside, California. Two paratypes will be placed in the Snow Entomological Collection at the University of Kansas.

Ashmeadiella (*Ashmeadiella*) *truncativentris*

Michener, new species

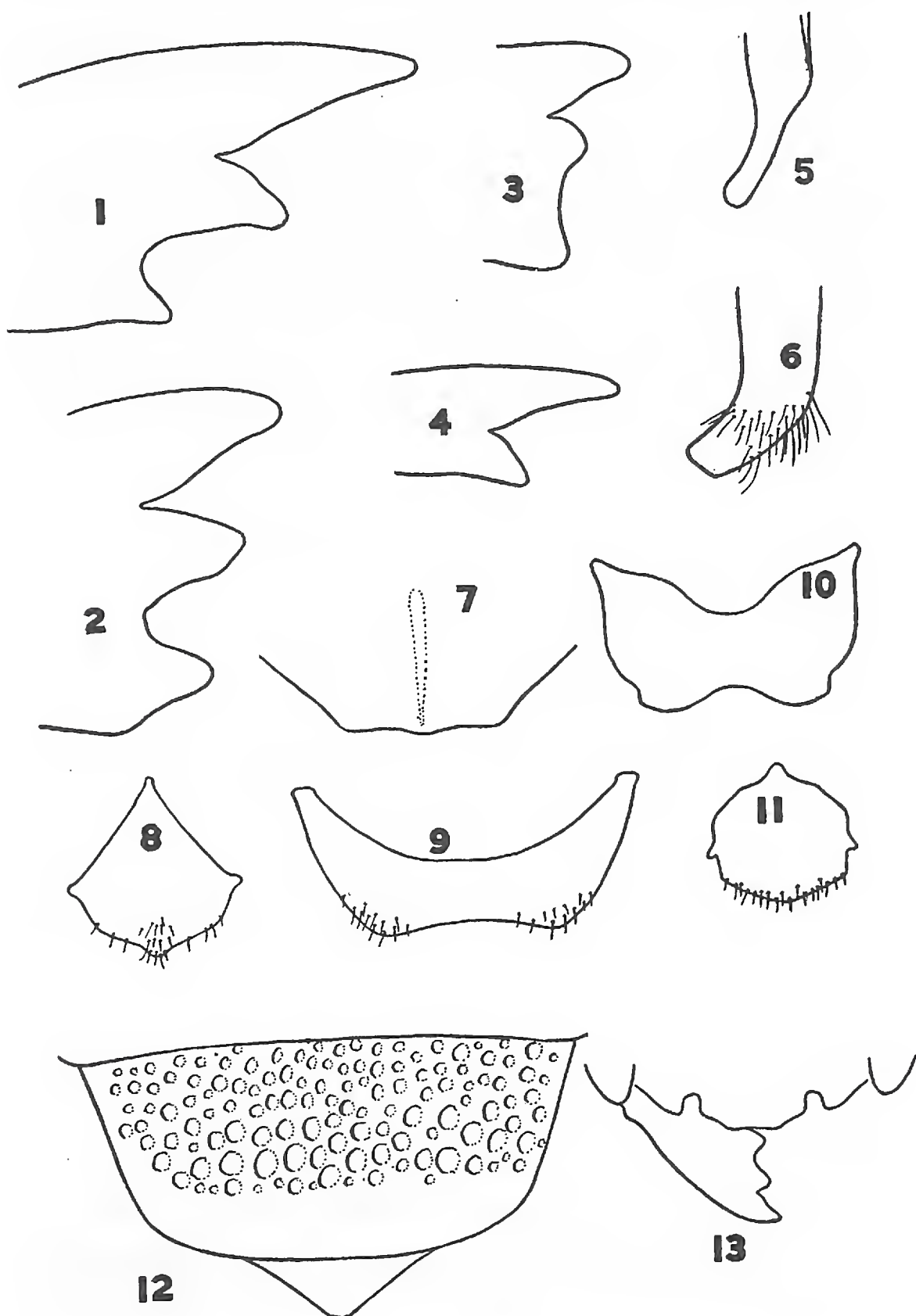
This striking species resembles *A. bigeloviae* Cockerell and its relatives in being black with the legs partly red. It differs, in the female, from *bigeloviae* as well as all other known species of *Ashmeadiella* by having a broad transverse shining subapical ridge across the sixth metasomal sternum, giving it the appearance of being broadly truncate. The hind tibial spurs are thick, black, and strongly curved as in *A. femorata* Michener and *A. titusi* Michener but they have more teeth than in these species, for which reason the male runs out at 2 in the key (Michener, 1939, Amer. Midland Nat., 22:12). The female differs from all species except *A. cactorum* (Cockerell) in lacking a smooth clypeal margin. The clypeus is flatter than in *cactorum*, which is an entirely unrelated and much smaller species.

Female: Length 7.5 mm. (6.0 mm. in paratype). Inner margins of eyes slightly converging below; facial line slightly shorter than transfacial; upper part of head and genal areas with punctures fine and close, becoming progressively coarser on lower part of supra-antennal area, supraclypeal area, and upper two-thirds of clypeus, being quite coarse and irregular and separated by shining ground in the latter area; lower third of clypeus with punctures very fine and dense, only an exceedingly narrow margin slightly raised and not conspicuously punctate; clypeal truncation slightly concave medially, demarked by rather distinct angles, slightly narrower than distance from its end to nearest eye margin; mandibles reddish subapically in paratype, distance from first to third tooth much less than greatest breadth of eye, nearly as great as length of last three antennal segments together; genal areas conspicuously narrower than eyes seen from side; anterior ocellus well behind midpoint between antennal bases and posterior edge of vertex; distance between posterior ocelli subequal to distance from one of them to eye, subequal to or greater than distance to posterior edge of vertex.

EXPLANATION OF FIGURES

1, Mandibular teeth of *Anthocopa beameri*, male. 2, Same, female. 3, Mandibular teeth of *Anthocopa daleae*, female. 4, Same, male. 5, Apex of male gonopod of *Anthocopa daleae*. 6, Same, *Anthocopa beameri*. 7, Clypeus, *Anthocopa daleae*, female. 8, Eighth metasomal sternum, *Anthocopa beameri*, male. 9, Seventh metasomal sternum of same. 10, Seventh metasomal sternum of *Anthocopa daleae*, male. 11, Eighth metasomal sternum of same. 12, Sixth metasomal sternum of *Ashmeadiella truncativentris*, female. 13. Clypeus and mandible of *Ashmeadiella clypeodentata simplicior*, female.

Mesoscutum with punctures small and dense, like those of vertex, anterior margin with weak pair of pubescent spots; punctures of mesepisternum markedly coarser and more widely separated than those of mesocutum or genal areas; tegulae black, distinctly punctured throughout; posterior femora and tibiae, middle femora, part of posterior trochanters, and undersides of middle tibiae red, hind tibial spurs black, strongly curved, outer spur with about eight teeth



on each margin, those of outer margin very low and oblique, inner spur with about nine teeth on each margin, those of outer margin very large and conspicuous, those of inner margin low. Abdominal terga more coarsely punctured than mesoscutum and except for the apical one less closely so; metasomal terga one to five with conspicuous apical bands of white hair, that on fifth weaker than the others; sixth tergum more broadly rounded than in most species; sixth sternum with basal half coarsely punctured, distal half impunctate and elevated to form a strong, slightly arcuate, subapical transverse ridge which is produced to each side to form distinct shoulders on the sternum.

Male: Length 6.2 mm. Similar to female in pubescence, punctuation, and structure, but clypeus not so coarsely punctate (though distinctly more coarsely so than vertex); anterior margin of clypeus with concavity, demarked by distinct angles and with an impunctate margin, this concavity about two-thirds as wide as upper width of clypeus; distitarsi rufescent and bases of posterior basitarsi red; hind tibial spurs with fewer teeth (outer margin of inner spur with about six large teeth) except for inner margin of inner spur which has ten or eleven teeth; lateral teeth of sixth tergum large and acute, median teeth longer than basal width, emargination between them deeper than a semicircle.

Holotype female, *allotype* male, and one female *paratype*: SANDERSON, TEXAS, on *Dalea formosa*, April 13, 1949 (R. H. Beamer, C. D. Michener).

Ashmeadiella (Arogochila) clypeodentata simplicior
Michener, new subspecies

Female: Differs from typical *clypeodentata* Michener by the weaker angles and emarginations of the median lobe of the clypeus, which is practically without a median emargination. Length 5.0 to 6.5 mm.

Holotype female and one female *paratype*: HOT SPRINGS, BIG BEND NATIONAL PARK, TEXAS, on *Prosopis juliflora*, April 11, 1949 (R. H. Beamer, C. D. Michener).

A. clypeodentata clypeodentata has been found only in the deserts of California and northwestern Mexico. The occurrence of the species in Texas is therefore interesting. It is of course possible that the Texan form is a different species but in view of the morphological similarity to the western form, this seems unlikely.

ASHMEADIELLA (AROGCHILA) EREMA Michener, 1939

A single female specimen was collected twenty-five miles southeast of Dryden, Texas, on *Dalea argyraea*, April 13, 1949 (R. H.

Beamer, C. D. Michener). This species was previously known only from the desert of eastern California. The Texan specimen differs from Californian ones in the broader dorsal black area of the abdomen.

ASHMEADIELLA (CHILOSIMA) RHODOGNATHA Cockerell, 1925

Cooper's Store, Big Bend National Park, Texas, on *Dalea neo-mexicana*, April 11, 1949 (C. D. Michener, R. H. Beamer). This species has not been known previously east of California and Baja California. The record is particularly interesting since it seems that *rhodognatha* is replaced in Arizona and New Mexico by the closely related form, *A. holtii* Cockerell. Unfortunately, only a single male specimen was obtained in Texas.

GELASTOCORIS ROTUNDATUS CHAMPION
IN CALIFORNIA

(Hemiptera: Gelastocoridae)

On February 24, 1951, a series of thirteen *Gelastocoris rotundatus* Champion¹ was taken by the writers on the bank of a small stream in Bennett Wash, eight miles southwest of Parker Dam, San Bernardino County, California. *G. rotundatus* is widely distributed in Mexico and Guatemala. Champion¹ remarks that this species "... will almost certainly be found to inhabit the Southern United States." Martin² records two specimens taken at Douglas, Arizona, in August, by F. H. Snow, and cites this as the first published record for the species in the United States.

G. rotundatus may be distinguished from all other members of the genus by means of the broadly convex, feebly sinuate pronotal margins, and by the male genitalia². The members of our series are relatively uniform in coloration, all being pale greenish above and brick-red on the abdominal sternites.

—P. A. ADAMS AND C. DON MACNEILL.

¹Champion, G. C., 1901, Biol. Centri.-Amer., Zoologia, Insecta, Rhynchota, Hemiptera-Heteroptera, 2:347, Tab. 20, fig. 18.

²Martin, C. H., 1928, Univ. of Kans. Sci. Bul., 18 (4):357, 363, pl. 58, fig. 16; pl. 59, fig. 8.

NEW NORTH AMERICAN SPECIES
OF NEMOGNATHA AND ZONITIS

(Coleoptera, Meloidae)

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Descriptions of the following new species are being published at this time in order to have names available for larval studies now in progress. The genus *Nemognatha* is treated here as belonging to the tribe Nemognathini which also includes the genera *Tricrania* and *Hornia* in North America. These three genera have the median tube of the male terminalia entirely membranous, a specialization not found among other meloids of this fauna. The genera *Zonitis* and *Gnathium* are included in the tribe Zonitini which exhibits the primitive condition of the aforementioned structure. Here the median tube is a heavily sclerotized and bilobed structure. By these definitions the species included in LeConte's (1880) key to the genus *Nemognatha* would remain in this genus with the exceptions of *immaculata* LeConte (= *Z. sayi* Wickham), *punctipennis*, *cribricollis* and *vittigera*. These species belong in the genus *Zonitis* near *Z. perforata* Casey, *Z. dunniana* Casey, *Z. atripennis* Say and *Z. bilineata* Say. *Z. flavida* LeConte is a well-marked western subspecies of *atripennis* and is not deserving of specific rank.

Zonitis, as considered here, is divisible into two species groups. The first and most typical includes those species listed in the previous paragraphs with the possible exception of *atripennis*. The second includes *longicornis* Horn, *vittipennis* Horn, *schaefferi* Blatchley, *arizonica* Van Dyke, *sulcicollis* Blatchley, *vigilans* Fall and *martini* Fall. *Z. vermiculatus* Schaeffer, although somewhat distinct, may be placed provisionally with the first group.

The structural modifications by which the *longicornis* group may be defined are: eyes strongly produced beneath the head, usually separated by less than the length of the second antennal segment; pronotum subcampanuliform; antennae setiform; male with fifth sternite deeply emarginate and with a distinct median impression; female with fifth sternite strongly emarginate, sixth sternite deeply triangularly emarginate; maxillae never produced. This combination of characters indicates the distinctness of this section of the

genus and might well be used to establish a separate subgenus. However, with the present confused status of these groups from a world standpoint such a move would seem premature at this time.

Zonitis aureus MacSwain, new species

Body surface shining. Color yellow, except antennae, apices of femora, tibiae and greater part of tarsi which are piceous, extreme base of first segment of middle and posterior tarsus pale. Length 7.5 — 9 mm.

Male: *Head* short, distance from vertex to apex of labrum equal to distance across tempora; surface smooth shining, sparsely punctate and pubescent, with a few fine punctures and short pale setae, setae on clypeus and labrum longer; antennae long, three times as long as pronotum, slightly tapered to apex, filiform, successive lengths of antennal segments in millimeters: .44, .37, .52, .52, .54, .54, .52, .50, .46, .48, .56, sixth segment almost three times as long as wide; mandibles strongly angulate at middle; maxillae not produced beyond mandibles. *Thorax* feebly punctate and pubescent throughout; pronotum strongly transverse, one-fourth wider than long, lateral margins evenly and broadly rounded, widest just in front of middle, surface smooth, shining, almost impunctate, a few, short, pale setae on disc, setae somewhat more dense on posterior margin, disc evenly rounded; elytra without distinct punctures, feebly rugose, somewhat transparent, with a few, short, pale setae. *Legs* with posterior tibial spurs moderately thickened, equal in length, outer spur one and one-half times as broad as inner spur, obliquely truncate near apex, inner spur flattened, parallel-sided, stick-like; tarsal claws with 13 or 14 spines in inner row. *Abdomen* with surface shining, a few, long, pale, scattered setae; fifth sternite broadly emarginate, sixth sternite deeply cleft.

Holotype male (Calif. Acad. Sci., Ent.): GRANT LAKE, MONO CO., CALIFORNIA, on flowers of *Chrysothamnus* sp. August 3, 1950 (J. W. MacSwain); and four *paratypes*, one same data as holotype, three same locality as holotype August 5, 1948 (P. D. Hurd and J. W. MacSwain).

This attractive species is morphologically similar to *vermiculatus* Schaeffer but may be separated by its color, pronotal shape, sparse punctation and pubescence.

Zonitis maculicollis MacSwain, new species

Body surface feebly shining. Color rufo-testaceous, except antennae, elytra, legs, portions of metasternum, small spot between eyes and paired spots on each side of midline in anterior third of pronotal disc which are piceous. Length, 6 — 11 mm.

Male: Head elongate, distance from vertex to apex of labrum considerably greater than distance across tempora; surface shining, with moderately coarse to fine punctures, punctures moderately dense between eyes, finer and sparser on vertex, with short, pale pubescence, setae longer on clypeus and labrum; eyes moderately large, separated in front by a distance slightly greater than length of sixth antennal segment, beneath by a distance equal to sixth antennal segment; antennae extremely long, three and one-half times as long as pronotum, setiform, successive lengths of antennal segments in millimeters: .58, .47, .63, .73, .73, .73, .73, .70, .63, .58, .73, sixth segment over four times as long as wide; mandibles slightly and evenly curved to apex, maxillae produced beyond mandibles a distance equal to length of mandibles. *Thorax* uniformly, finely, and densely punctate except on pronotum; pronotum, subcampanuliform, about as long as width across base, finely, but only moderately, densely and somewhat irregularly punctured, with extremely short, pale, erect setae, surface evenly rounded except median line which is sulcate posteriorly; elytra densely and moderately coarsely punctate, with fine, short, pale, appressed pubescence. *Legs* with posterior tibial spurs thickened, obliquely truncate in lateral aspect, subacute and subequal; tarsal claws with inner row of spines decreasing in number from anterior pair to posterior (15, 13, 11). *Abdomen* with surface moderately shining, with fine, dense punctures and moderately long, pale, dense pubescence; fifth sternite broadly emarginate, with a sharp, median impression; sixth sternite deeply cleft.

Female similar to male but with fewer spines on tarsal claws (8, 8, 8); sixth sternite with a deep U-shaped emargination.

Holotype male (Calif. Acad. Sci., Ent.): TRACY, SAN JOAQUIN Co., CALIFORNIA, on flowers of *Frankenia grandifolia* C. & S., July 29, 1949 (J. W. MacSwain); *allotype* female (Calif. Acad. Sci., Ent.) same data as holotype; and 85 *paratypes* same data as holotype.

This species is related to *Z. vigilans* Fall and belongs with that species in the *longicornis* group. However, it may be separated by its darker color, much smaller and more distant eyes, larger head and pronotum, and details of punctation. The eyes in this species are smaller and more distant than in *Z. martini* Fall. The coloration varies somewhat in the type series with the maculations of the head and pronotum being absent in a few specimens while in others portions of the abdomen are suffused with brown.

Zonitis propinqua MacSwain, new species

Body surface feebly shining. Color testaceous, except antennae, maxillary prolongations, maxillary palpi, last segment of labial

palpi, apices of femora, tibiae except inner basal face and tarsi which are piceous. Length 10 — 18 mm.

Male: Head moderately elongate, distance from vertex to apex of labrum greater than distance across tempora; surface feebly shining, with fine and extremely dense punctures, clothed with moderately long, pale pubescence; antennae robust, two and one-half times as long as pronotum, segments cylindrical, successive lengths of antennal segments in millimeters: .74, .51, .66, .74, .66, .66, .58, .66, .55, .51, .70, sixth segment scarcely twice as long as wide; mandibles slightly and evenly convex to apex; maxillae produced beyond mandibles a distance one and one-fourth the length of the mandibles, prolongations modified as a sucking organ. Thorax uniformly, finely, and very densely punctured, clothed with moderately long, pale, erect pubescence, feebly shining; pronotum considerably wider than long, transverse, lateral margins feebly convex; elytra finely and very densely punctured, punctures distinct, pubescence moderately long, pale, and erect, visible macroscopically. *Legs* with posterior tibial spurs thickened, subequal, outer spur slightly heavier than inner, both obliquely truncate in lateral aspect, apically moderately acute; tarsal claws with inner row of spines decreasing in number from anterior pair to posterior (16, 14, 11). *Abdomen* with surface feebly shining, finely and densely punctate, with moderately long, pale, semi-appressed pubescence; fifth sternite with a distinct, short, median impression; sixth sternite deeply cleft.

Female similar to male but with a different number of spines on the tarsal claws (15, 15, 15); sixth sternite with a moderately deep, V-shaped emargination.

Holotype male (Calif. Acad. Sci., Ent.): ALPINE, BREWSTER CO., TEXAS, July 2, 1942 (E. C. Van Dyke); *allotype* female (Calif. Acad. Sci., Ent.): same data as holotype; and 16 *paratypes* same locality as holotype and following dates and collectors: 2, May 19, 1937 (K. Maehler), 1, July 1, 1942 (H. A. Scullen), 2, July 1, 1942 (E. C. Van Dyke), 2, July 2, 1942 (E. C. Van Dyke), 3, July 7, 1942 (H. A. Scullen), 5, July 8, 1942 (E. C. Van Dyke), 1, July 11, 1946 (M. Marquis).

The following additional specimens of this species were examined but not included in the type series: 2, 5 mi. E. Alpine, Brewster Co., Texas, June 5, 1942 (E. S. Ross), 1, Marathon, Brewster Co., Texas, July 7, 1942 (E. C. Van Dyke), 1, Chisos Mts., Brewster Co., Texas, July 7, 1946 (E. C. Van Dyke), 2, Davis Mts., Jeff Davis Co., Texas, July 11, 1946 (E. C. Van Dyke), 2, White Rose Canyon, Jeff Davis Co., Texas, June 18, 1947 (A. T. McClay), 1, Uvalde, Uvalde Co., Texas, June 15, 1930 (J. O. Martin), 9.

Pecos, Reeves Co., Texas, June 18-19, 1947 (A. T. McClay), 1, Loving, Eddy Co., New Mexico, June 5, 1945 (J. W. MacSwain), 3, San Jon, Quay Co., New Mexico, July 5, 1938 (R. P. Allen), 2, Mt. Hope, Sedgwick Co., Kansas, July 22, 1909 (F. E. Blaisdell) and 1, Onaga, Pottawatomie Co., Kansas, June 19, 1923 (Crevecoeur).

This species is closely related to *Z. vittigera* (LeConte) but differs in its lighter color, denser pubescence, shorter maxillary prolongations and the lack of elytral vittae. In addition, it has a more southerly distribution although occurring principally in June and July as does *vittigera*. These two species are related to *Z. perforata* Casey which has short maxillary prolongations, as in *propinqua*, and reddish-brown elytra which are coarsely but only moderately densely punctured.

Nemognatha cantharidis MacSwain, new species

Body surface shining, elytra dull. Color: head piceous; antennae, palpi, maxillae, metasternum, and legs dark brown, nearly piceous; pro-, mesothorax and abdomen orange; elytra flavo-testaceous with dark piceous suffusion near humeri and apices, coloration variable, rarely with all of elytra, except extreme outer margin, piceous. Pubescence golden. Length 9 — 11 mm.

Male: Head elongate; tempora evenly rounded; surface moderately, coarsely and densely punctured, a narrow, median, sparsely punctate area extending from between eyes to vertex; antennae filiform, less than three times length of pronotum, successive lengths of antennal segments in millimeters: .51, .33, .51, .53, .48, .48, .44, .44, .37, .37, .50, sixth segment twice as long as wide; mandibles elongate, moderately, strongly, and obtusely convex beyond middle; maxillae produced beyond mandibles a distance equal to one and one-half times length of pronotum, clothed with appressed scale-like setae. *Thorax*, except pronotum, finely and densely punctured; pronotum moderately and coarsely punctured; punctures moderately, but irregularly, dense, pronotum as long as wide, widest just in front of middle, rapidly narrowed to apex, slightly narrowed to base, disc with a faint median impression, surface feebly sulcate on each side of midline in front of middle; scutellum with a sharp, deep impression at extreme base, usually partially hidden under posterior margin of pronotum; elytra densely punctate, most punctures confluent, clothed with dense, appressed, golden pubescence. *Legs* with posterior tibial spurs equal, broad, obtuse; tarsal claws with spines of inner row decreasing in number from anterior pair to posterior (14, 12, 10). *Abdomen* finely and moderately densely punctured; fifth sternite feebly and broadly convex, sixth sternite deeply cleft.

Female similar to male but with a different number of spines on the tarsal claws (10, 10, 10); sixth sternite evenly transverse.

Holotype male (Calif. Acad. Sci., Ent.): BENNETT WASH NEAR PARKER DAM, SAN BERNARDINO CO., CALIFORNIA, on flowers of *Encelia* sp., February 24, 1951 (C. D. McNeill and P. A. Adams); *allotype* female (Calif. Acad. Sci., Ent.) same data as holotype; and 15 *paratypes* as follows: 1, same data as holotype, 5, 3 mi. S. Palo Verde, Imperial Co., California, on flowers of *Geraea canescens*, April 8, 1949 (P. D. Hurd), 1, Ocotillo, San Diego Co., California, April 6, 1949 (P. D. Hurd), 6, 5 mi. S. E. Ocotillo, San Diego Co., California, on flowers of *Pluchea sericea*, April 23, 1950 (J. W. MacSwain), and 1, Palm Springs, Riverside Co., California, April 16, 1916 (J. O. Martin).

The following additional specimens of this species were examined but are not included in the type series: 5, 9 mi. up Arroyo Santa Maria, Baja California, Mexico, March 29, 1950 (G. A. Marsh).

N. cantharidis is related to *N. zonitoides* Duges but may be distinguished by its larger size, coloration, pubescence and the shape of its pronotum which is not campanuliform as in *zonitoides*.

Nemognatha hurdi MacSwain, new species

Body surface feebly shining. Color flavo-testaceous to testaceous with following exceptions which are dark brown or piceous: antennae, palpi, mandibular apices, maxillae, meso- and metasternum, scutellum and part or all of first five abdominal segments; elytra with apex piceous and a piceous vitta near lateral third which tapers markedly before humeri. Pubescence short and pale, sparse or dense. Length 10 — 13 mm.

Male: *Head* moderately elongate, subtriangular, tempora diverging behind the eyes, vertex tumid; surface finely and evenly densely punctured, macroscopically glabrous; antennae filiform, less than two and one-half times length of pronotum, segments not flattened, successive lengths of antennal segments in millimeters: .66, .39, .70, .55, .58, .58, .44, .41, .41, .39, .55, sixth segment slightly over twice as long as wide; mandibles robust, strongly curved near middle; maxillae produced beyond mandibles a distance one-fourth greater than length of pronotum, clothed with short semi-erect setae. *Thorax*, except pronotum, finely and densely punctured, clothed with moderately long, pale setae; pronotum only one-sixth wider than long, margins widest in front of middle, converging slightly toward base, basal

angles expanded, surface finely and moderately densely punctured, most punctures separated by scarcely their own diameter, disc evenly rounded with a fine median impression, macroscopically glabrous; scutellum with fine regular punctures, feebly sulcate; elytra densely punctulate, punctures distinct near humeri, confluent elsewhere, clothed with fine, short, pale, dense, appressed pubescence, giving elytra a dull appearance. *Legs* with posterior tibial spurs unequal, outer spur somewhat thickened from base to apex, apex broadly rounded, inner spur stick-like, apically somewhat acute; tarsal claws with inner row of spines decreasing in number from anterior pair to posterior (16, 14, 12). *Abdomen* with surface feebly shining, finely and densely punctured, small triangular median areas of dense pubescence on third and fourth sternites, fifth sternite evenly and slightly convex, sixth deeply cleft.

Female similar to male but with a different number of spines on the tarsal claws (10, 10, 10); fifth sternite with a small feeble emargination, the sixth not visible.

Holotype male (Calif. Acad. Sci., Ent.): TESLA, ALAMEDA CO., CALIFORNIA, on flowers of *Grindelia* sp., September 18, 1945 (J. W. MacSwain); *allotype* female (Calif. Acad. Sci., Ent.) same data as holotype; and 7 *paratypes*, 1, same data as holotype, 5 same locality as holotype, October 6, 1941 (J. W. MacSwain).

The following additional specimens of this species were examined but are not included in the type series: 1, 2 mi. W. Antioch, Contra Costa Co., California, September 12, 1945 (J. W. MacSwain), 1, Marsh Creek Canyon, Contra Costa Co., California, reared from cell of *Melissodes* sp. collected February 18, 1947 (G. E. Bohart and J. W. MacSwain), and 1, Mormon Bar, Mariposa Co., California, September 6, 1938 (T. G. H. Aitken).

This species is distinguished by its short, pale pubescence, punctulate elytra, coloration, antennae, and tibial spurs. Its affinities are with *N. dichroa* LeConte. It is most often collected in association with the much commoner *N. apicalis* LeConte.

Nemognatha soror MacSwain, new species

Body surface shining. Six discontinuous coloration patterns are known; coloration of three commonest forms (condition of type first) with approximate frequency of each form expressed in per cent; black, head, pronotum and apex of abdomen rufo-testaceous (45%), entirely black (25%), entirely brown (25%). Pubescence usually black moderately dense to sparse. Length 7.5 — 15 mm.

Male: Head short, distance from vertex to apex of labrum less than distance across tempora, tempora diverging somewhat behind the eyes, vertex not tumid; surface moderately coarsely and moderately densely punctured, punctures with long, black, erect setae, a small, median impression between the eyes; antennae filiform, serrate, segments somewhat flattened, slightly more than twice as long as pronotum, successive lengths of antennal segments in millimeters: .48, .39, .51, .51, .44, .44, .41, .41, .38, .38, .51, sixth segment slightly less than twice as long as wide; mandibles robust, moderately curved near middle; maxillae produced beyond mandibles a distance equal to the length of the pronotum, clothed with short, semi-erect hairs. *Thorax*, except pronotum, finely and moderately densely to densely punctured; pronotum finely and moderately sparsely punctured, most punctures separated by at least their own diameter, punctures on disc set with moderately long, black setae which are inclined anteriorly, pronotum transverse, parallel-sided, subrectangular, one-third wider than long, disc without a median impression, a small, irregular, impunctate area near each side just in front of middle; scutellum feebly sulcate; elytra finely and moderately densely punctate, surface rugose, clothed with short, moderately dense, semi-appressed, black pubescence. *Legs* with posterior tibial spurs unequal, outer spur slightly thicker than inner and obliquely truncate, inner spur stick-like, apically acute; tarsal claws with inner row of spines decreasing in number from anterior pair to posterior (16, 14, 12). *Abdomen* with surface shining, finely and moderately densely punctured, clothed with long, dark, semi-appressed pubescence; fourth and anterior part of fifth sternites with a median patch of dense pubescence; fifth sternite moderately and evenly convex, with a distinct median impression on posterior margin; sixth sternite deeply cleft.

Female similar to male but with a different number of spines on the tarsal claws (10, 10, 10); fifth sternite with a small feeble median emargination, the sixth not visible.

Holotype male (Calif. Acad. Sci., Ent.): 4 MI. W. QUINCY, PLUMAS Co., CALIFORNIA, on flowers of *Achillea* sp., June 24, 1949 (J. W. MacSwain); *allotype* female (Calif. Acad. Sci., Ent.) same data as holotype; and 90 *paratypes* (various color forms) same locality as holotype, various dates from June 19, 1949 to July 3, 1949 by following collectors (P. D. Hurd, J. W. MacSwain, A. S. Deal, R. C. Bechtel, W. F. Ehrhardt, L. W. Isaak, E. I. Schlinger, H. A. Hunt, Claude I. Smith, D. Cox and L. L. Jensen).

A number of specimens from areas adjacent to the type locality were studied as well as the two following collections; 95 specimens Pinnacles, San Benito Co., California on flowers of *Achillea*, May 25, 1941 (J. W. MacSwain) and 15 specimens Princeton, British Columbia, June 16, 1921 and July 30, 1922 (R. Hopping).

This species belongs with the *dubia-dichroa* complex. *Soror* can be recognized by the very short maxillae, which are several times as long in the other species, and the transverse pronotum as well as by the details of the punctation and pubescence.

SELECTED BIBLIOGRAPHY

BLATCHLEY, W. S.

1910. On the Coleoptera known to occur in Indiana. Indianapolis, 1910, 1386 pp., 595 figs.

1922. Some new and rare Coleoptera from southwestern Florida. Can. Ent., 54:27-33.

CASEY, T. L.

1891. Coleopterological Notices. III. Ann. N. Y. Acad. Sci., 6:9-214.

CHAMPION, G. C.

1889-93. Insecta, Coleoptera, Heteromera. Biologia Centr.-Amer., 4(2):1-494, 21 pls.

FALL, H. C.

1907. Descriptions of new species. Trans. Am. Ent. Soc., 33:218-272.

HORN, G. H.

1870-1. Contributions to the Coleopterology of the United States. Trans. Am. Ent. Soc., 3:69-97.

LECONTE, J. L.

1852-3. Synopsis of the Meloides of the United States. Proc. Acad. N. S. Phila., 6:328-350.

1858. Description of new species of Coleoptera, chiefly collected by the United States and Mexican Boundary Commission, under Major W. H. Emory, U.S.A. Proc. Acad. N. S. Phila., 10:59-89.

1868-69. New Coleoptera collected on the Survey for the extension of the Union Pacific Railway, E. D. from Kansas to Fort Craig, New Mexico. Trans. Am. Ent. Soc., 2:49-59.

1880. Short studies of North American Coleoptera. Trans. Am. Ent. Soc., 8:163-218.

SAY, T.

1817. American Entomology, Publ. Mitchell and Ames, Phila., i-x, no pagination, 6 pls.

SCHAEFFER, C.

1905. Additions to the Coleoptera of the United States with notes on some known species. Bull. Brooklyn Inst. Arts Sci., 1(6):123-140.

VAN DYKE, E. C.

1929. New species of Meloidae (Coleoptera) Bull. Brooklyn Ent. Soc., 24(3):127-133.

WICKHAM, H. F.

1905. New species of Coleoptera from the western United States. Can. Ent., 37:165-171.

LIRIOMYZA LANGEI, A NEW SPECIES OF LEAF MINER
OF ECONOMIC IMPORTANCE IN CALIFORNIA

(Diptera: Agromyzidae)

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The agromyzid described below has been confused with *Liriomyza flaveola* (Fallén, 1823) (Lange, 1945; Smith and Lange, 1946; Jefferson and Pence, 1948, 1949), and *L. orbona* (Meigen, 1830) (Melander, 1913; Frost, 1943; Lange and Smith, 1947).

The species is named in honor of W. Harry Lange, Jr., entomologist on the University of California staff, who has studied its biology and methods of control. The common name "pea leaf miner" is suggested since the species has primarily been a pest of garden pea (*pisum sativum*). More recently, this same species has caused damage to aster plantings in southern California (Jefferson and Pence, 1949).

Liriomyza langei Frick, *new species*

Male—Shining black and yellow. Head yellow; ocellar triangle and back of head black, black of back reaching eye margin immediately dorsad of median curve on posterior margin and extending as dusky brown ventrally on genovertical plates between eyes and vti and fronto-orbital setae to lower ifo setae. Antennae yellow, third segment faintly darkened distally; arista black. Proboscis and palpi yellow. Thorax with mesonotum shining black, extending laterally to humeri, prs, sa, and outer pa setae; anepisternum (fig. 1) mostly black, narrowly yellow posteriorly, rather broadly so dorsally, ventral margin irregular; katepisternum (fig. 1) broadly black, narrowly yellow dorsally; anepimeron black, yellow margin anteriorly rather broad, narrow ventrally. Legs black, tips of femora yellowish, fore- and mid-femora yellowish brown to yellowish on inner sides nearly to trochanters; tarsi black. Halteres yellowish. Wings hyaline, calypters gray, margins blackened; setulae of fringe black. Abdomen black dorsally; first segment anteriorly very narrowly yellow; all segments but first posteriorly very narrowly yellow, i.e., posterior of last row of setulae; pleurae yellow; sternites broadly yellow posteriorly, brownish anteriorly. Hypandrium black; cerci yellow.

Head—Eyes large. Genae rather elongate ventrally, more so posteriorly, one-third eye height midway between posterior margin and vibrissa; only slightly sunken centrally; four setae on subcranial margin; vibrissa about three times as long as these setae; parafacial

¹Published as Scientific Paper No. 910, Washington Agricultural Experiment Stations, Institute of Agricultural Sciences, The State College of Washington, Pullman.

region raised above eye margin, genovertical plates only slightly so. Genovertical plates moderately broad, each approximately one-fourth width between eyes; two ifo (three on one side); two sfo, all subequal in length; os small, sparse, about five in number, dorsal-most slightly dorsad of lower sfo. Frontal vitta two-thirds as broad as long, very slightly sunken below genovertical plates; ocellar triangle of normal size, about four small setulae, ocellar setae long, nearly equaling frontal vitta. Lunule small, semicircular in outline; mesofacial plate about two-thirds as long as broad, a very low rounded median carina becoming inconspicuous between approximate antennal bases; postclypeus narrow, not over one-fourth height of mesofacial plate. Antennae with third segment rounded, broader than long, in width one-third eye height, very finely pubescent; arista short, two and a half times as long as height of third segment, slightly swollen on basal fourth. Proboscis rather large; palpi short, cylindrical.

Thorax—Mesonotum slightly longer than broad; one h and three and five setulae on humeri; one prs, a setula less than one-third length of prs anterior to it; one sa; 0 ia, five to seven setulae in ia row; two pa, inner strong, two-thirds length of outer; 3 + 1 dc, strong, a setula about one-third length of fourth immediately anterior to it; distances between them, beginning with first, 2.25 : 1.75 : 2; acr sparse, relatively long, ten in about four irregular rows reaching posteriorly to second dc. Pleurae with pp very strong; two npl, strong, subequal; one aes, two setulae near dorsal margin dorsally directed, two on posterior margin posteriorly directed, one dorsad of and the other ventrad of aes (fig. 1); one kes, one setula anterior to it, dorsally directed.

Legs—All tibiae with a short apical spur, two on mid-tibiae, stronger; no setae centrally on mid-tibiae.

Wings—About two and one-fourth times as long as broad, veins strong; costa reaching $M_1 + 2$, distad of wing tip; costal segments in proportions of 7 : 1.75 : 1.5; crossvein r-m basad of termination of R_1 in costa; crossvein m-m present, at an oblique angle, 1.2 times its length from r-m; ultimate section of $R_4 + 5$ about nine times as long as penultimate; ultimate section of $M_1 + 2$ nearly 7.5 times as long as penultimate; ultimate section of $M_3 + 4$ about two times as long as penultimate, ending in margin two-thirds of distance from wing base to apex; Cu + Pl extending about three-fourths of distance to wing margin.

Abdomen—Elongate ovoid; rather sparsely covered with moderately long slender setulae; hypandrium with very few setae.

Size—1.75 mm. in body length; wing: 1.75 mm. in length.

Female—Similar to male in coloration and general appearance; os setae extending slightly dorsad of lower sfo, six and eight in number; second antennal segments slightly darkened; three setulae on each humerus; acr setae about 23 in number, four irregular rows reaching posteriorly to second dc; anepisternum with three posteriorly directed setulae, two dorsad of aes; sixth abdominal

segment with posterior yellow margin rather broad, one-fourth width of segment; seventh segment large, conical, one-fourth length of abdomen; two irregular rows of relatively long setulae on posterior half; shining black.

Size— 2 mm. in body length; wing: 2 mm. in length.

Holotype ♂: SUNNYVALE, SANTA CLARA COUNTY, CALIFORNIA, October 15, 1948, K. E. Frick, reared from a leaf mine on garden pea; deposited in the California Academy of Sciences. *Paratypes*: 17 ♂♂, 29 ♀♀, topotypical; 2 ♂♂, 6 ♀♀, Sunnyvale, Santa Clara County, California, September 28, 1948, K. E. Frick, reared from leaf mines on sugar beet; 1 ♂, 3 ♀♀, Salinas, Monterey County, California, October 30, 1948, K. E. Frick, reared from leaf mines in packages of spinach purchased in Berkeley, California, grocery stores; 3 ♂♂, Sunnyvale, Santa Clara County, California, September 27, 1948, K. E. Frick, reared from leaf mines on celery; 3 ♂♂, 1 ♀, Soledad, Monterey County, California, November, 1946, A. J. Walz, reared from leaf mines on spinach; 5 ♂♂, 6 ♀♀, San Jose, Santa Clara County, California, October 23, 1928, University of California collection, reared from mines on pea.

Other material examined.—A single specimen, Pullman, Whitman County, Washington, "Webster #5938, Aug. - 5 - 18," reared from leaf mine on pea, leaf and puparium on pin, and other specimens from Washington and Idaho, all in Melander's collection; 82 ♂♂, 87 ♀♀, topotypical (in alcohol); 25 ♂♂, 15 ♀♀, Sunnyvale, Santa Clara County, California, September 9, 1948, K. E.

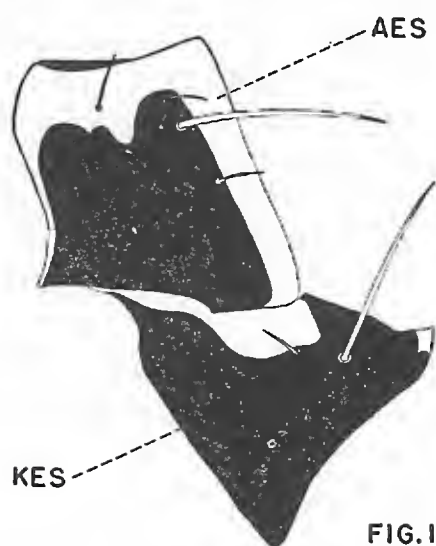


FIG. 1



FIG. 2

Fig. 1. Anepisternum (AES) and katepisternum (KES) of the holotype ♂ of *Liriomyza langei* n. sp., showing the distribution of yellow and black areas. The solid line equals 0.5 mm.

Fig. 2. Anepisternum and katepisternum of a homotype ♀ of *Liriomyza orbona* (Meigen, 1830), showing distribution of yellow and black areas.

Frick, swept from sugar beet field; 1 ♀, Berkeley, Alameda County, California, November 1, 1948, K. E. Frick, reared from leaf mine on sugar beet; 4 ♀♀, Sunnyvale, Santa Clara County, California, September 9, 1948, K. E. Frick, swept from celery field; 1 ♂, Berkeley, Alameda County, California, October 20, 1948, K. E. Frick, reared from leaf mine on celery grown in a greenhouse; 4 ♂♂, 1 ♀, Berkeley, Alameda County, California, November 13, 1948, K. E. Frick, reared from leaf mine on aster or as adults on asters leaves in a greenhouse; 6 ♂♂, 39 ♀♀, Torrence, Los Angeles County, California, 1948, R. N. Jefferson, reared from leaf mines on aster (in alcohol).

Liriomyza orbona Meigen differs from *L. langei* as follows:

Adult homotype ♀—Dusky color of genoververtical plates extending only to lower sfo; third antennal segment yellow on basal two-thirds, abruptly becoming dark brown distally; palpi brownish. Anepisternum black, a very narrow yellow strip on dorsal and posterior margins (Fig 2); katepisternum black, a very small yellowish area dorsally (Fig. 2). First and second abdominal tergites yellow laterally; fourth and fifth entirely black; sixth yellow posteriorly, about one-fifth of tergal width. Head (Hendel, 1931, Fig. 248)—Genae half eye height midway between vibrissa and posterior margin, genoververtical plates and parafacial region greatly exceeding eye margin; postclypeus nearly half height of mesofacial plate. Thorax—Setula anterior to prs not differentiated from acr; O ia, about seven setulae in ia row; distances between dc setae, 1.75 : 1.5 : 2; no differentiated setulae anterior to fourth dc; about 30 acr, extending posteriorly nearly to first dc. Wings (Hendel, 1931, Fig. 247)—Costal segments in proportions of 8:2:1.75; crossvein r-m and termination of R_1 about equidistant from base of wing; crossvein m-m less than its own length from r-m; ultimate section of $R_4 + 5$ about 6.5 times as long as penultimate; ultimate section of $M_1 + 2$ about 16 times as long as penultimate; ultimate of $M_3 + 4$ slightly less than 2.5 times the penultimate.

Male terminalia (de Meijere, 1925:289, Fig. 58c, surstylus).—Surstyli bearing setae; strong tooth absent.

Puparium (de Meijere, 1925:273)—Posterior spiracles with about 12 subequal bulbs arranged in an arc; anal lobes small, short, truncate.

Liriomyza orbona is not common in Europe, and the species has never been reared from larvae. De Meijere (1925) reared *L. orbona* adults from puparia found in the debris and refuse left by an overflowing of the Rhein River near Lotith in 1924. The species was not mentioned in subsequent papers. Hendel (1931) mentioned that the ecology was unknown, but since the adults were repeatedly found in meadows, he felt that the larvae are probably grass miners.

Hering recently stated in correspondence that the larvae are probably grass miners.

Hendel (1931) found *Liriomyza orbona* so closely related to *L. flaveola* that he referred to the thoracic setal pattern of the latter species in describing *L. orbona*, noting but a few minor differences. De Meijere (1925) states that the puparium of *L. orbona* is similar to those of *L. flaveola* and of the "*L. pusilla* complex." Hering found several differences between adults of *L. orbona* and *L. langei*, based on material sent to him, adding that *L. langei* does not occur in Europe.

Liriomyza langei may be distinguished from other species of *Liriomyza* by the large size, characteristic wing venation, and distinctive color pattern, particularly of the thoracic pleural region. The new species is closely related to the European *L. orbona* and therefore rather close to *L. flaveola*. On the basis of the form of the surstyli, *L. langei* appears to be closer to the species in the "*L. pusilla* complex" than to *L. orbona*. Hering found that leaves sent to him containing mines made by the larvae of *L. langei* were very similar to those made by the larvae of the European *L. strigata*.

VARIATIONS WITHIN THE SPECIES

The specimens of this species are quite constant in most characters, particularly in the coloration. The setae vary within relatively narrow limits, the os setae varying from three to eight, sometimes not extending dorsad of the lower sfo; only rarely do three ifo occur on one side (as in the holotype ♂); humeral setulae vary from two to five, with usually three or four present; the acr setae sometimes extend posteriorly to the second dc but are always sparse; an extra posteriorly directed setula sometimes occurs on the anepisternum, and one of the dorsally directed ones is sometimes absent. The most striking variation is the loss of the m - m crossvein (Table I). The crossvein may be vestigial, often being reduced to one or two short vestiges, or absent. The figures indicate that the females tend to have slightly more variation than the males, and that the absence of the crossveins is relatively rare, particularly where one is absent in one wing and the other complete in the other wing.

LARVA

(Described from larvae obtained from mines in *Pisum sativum* leaves and preserved in alcohol.) Large, 3.25 mm. in length, five-eighths to three-fourths mm. in diameter. White, yellowish on anterior one-third, shining.

Head—Antennae minute, light brown; palpi relatively large, blackish; longitudinal sclerite inconspicuous, narrow, light brown, lateroventral arms not discernible. Mandibles each with two teeth, alternated; labial sclerite three-fourths the length of mandibles, moderately broad, visibly partially separated from paraclypeal phragma; dorsal arm three times the length of labial sclerite, curving anteriorly, nearly straight posteriorly, not narrowing but becoming paler posteriorly; ventral arm two-thirds the length of dorsal, very slender, nearly straight.

Body—Anterior spiracles small, scarcely expanded distally; six bulbs arranged in a single inwardly curving row. Cuticular processes minute, of one size; bands relatively narrow. Posterior spiracles of moderate size; somewhat expanded distally, more so ventrally; seven or eight bulbs, rather widely spaced, arranged in a semicircle, open towards midline. Posterior end truncate; a pair of minute lateral lobes two-thirds of distance from dorsal surface; anal lobes very small, rounded. Calcospherites numerous; large, many slightly over one-sixth larval diameter.

Puparium—Large, 2 mm. in length, nearly 2 mm. in width and height. Reddish brown in color. Subcylindrical, laterally sides subparallel, tapering rather sharply at the ends; ventral surface flattened, dorsal arched; segmentation distinct. Anterior spiracles rather close together, same form as in larva; posterior spiracles subdorsal, about twice as far apart as anterior, moderately long, of same form as in larva. Anal slit dark brown, lateral lobes absent.

DESCRIPTION OF THE LEAF MINES

The mines are characterized by being relatively wide, even from the start, and often widen to as much as twice the larval width for most of the length. The mines are serpentine and are often so twisted as to cross many times, sometimes having a blotch-like appearance. The frass is deposited almost entirely in small strings forming a nearly continuous slender black line down the center of the mine. The mines are primarily on the dorsal surface of the leaves, but often extend to the ventral, and are usually on the basal half of the leaves, often running down the petioles from which place the larva emerges.

Certain modifications in the mines are found in each species of host plant, and notes are added here based upon mined leaves in the writer's collection. On aster, the mines are usually basal on the leaves, extending down the petiole, often to its base. The lateral ribs appear not to impede larval movement. On pea, the mines are on both surfaces, single mines often alternating. The midribs and lateral ribs seem to act as barriers, the mines usually being confined to a relatively small area and appearing blotch like. There are often two or three mines per leaf, and they are often found on the stems

TABLE 1

Percentages of loss of crossvein m-m in the wings of 455 adults of *Liriomyza langei* n. sp.

Condition of m-m crossveins per specimen	MALE			FEMALE			TOTAL	
	Host	Number	%	Host	Number	%	Number	%
2 complete	Pea (Sunnyvale)	99	80.4	Pea (Sunnyvale)	117	66.1		
	(San Jose)	5	100.0	(San Jose)	6	100.0		
	Sugar Beet	36	97.3	Sugar Beet	28	80.0		
	Celery	4	80.0	Celery	4	66.6		
	Spinach (Salinas)	2	100.0	Spinach (Salinas)	1	33.3		
	(Soledad)	2	66.6	Aster (Berkeley)	3	100.0		
	Aster (Berkeley)	3	75.0	(Torrence)	35	89.7	350	76.9
1 complete								
1 vestigial	Pea (Sunnyvale)	9	7.3	Pea (Sunnyvale)	20	11.2		
	Spinach (Soledad)	1	33.3	Sugar Beet	3	8.6		
				Spinach (Soledad)	1	100.0	34	7.5
1 complete	Pea (Sunnyvale)	1	.8	Pea (Sunnyvale)	1	.6		
1 absent	Sugar Beet	1	2.7				3	.66
2 vestigial	Pea (Sunnyvale)	9	7.3	Pea (Sunnyvale)	23	12.9		
	Aster (Berkeley)	1	25.0	Sugar Beet	2	5.7		
	(Torrence)	1	16.6	Celery	2	33.3		
				Spinach (Salinas)	1	33.3		
				Aster (Torrence)	3	7.7		
1 vestigial	Pea (Sunnyvale)	3	2.4	Pea (Sunnyvale)	11	6.2	42	9.2
1 absent	Celery	1	20.0	Sugar Beet	2	5.7		
							17	3.7
2 absent	Pea (Sunnyvale)	2	1.6	Pea (Sunnyvale)	5	2.8		
				Spinach (Salinas)	1	33.3		
				Aster (Torrence)	1	2.6	9	1.9

and pods. Mines on celery are similar to those found on aster in that the mines are usually on the basal portions and often extend down the petiole. However, the leaf ribs appear to inhibit movement and the mines appear to be blotches. The mines on the large leaves of sugar beet and spinach are similar, being found rather often on the outer portions of the leaves, and are not so twisted, but still serpentine.

ACKNOWLEDGMENTS

The help of the following persons is gratefully acknowledged: E. M. Hering for aid in determination of the species; A. J. Walz, P. D. Hurd, Jr. (curator of the University of California collection), and R. N. Jefferson for loan of material; W. H. Lange, Jr., for a trip to the Santa Clara Valley; A. L. Melander for permission to study his personal collection; and A. E. Pritchard for reading and criticizing the manuscript.

LITERATURE CITED

FROST, S. W.

1943. Three new species of Diptera related to *Agromyza pusilla* Meig. Jour. N. Y. Ent. Soc., 51:253-260.

HENDEL, F.

1931. Agromyzidae, IN Lindner: Die Flieg. Palaearkt. Reg., 59 (58):236-238.

JEFFERSON, R. N. and R. J. PENCE

1948. Aster leaf miner. Calif Agriculture, 2 (1):11.

1949. Preliminary experiments on the control of the leaf miner *Liriomyza flaveola* on asters. Jour. Econ. Ent., 41:653.

LANGE, W. H., JR.

1945. IN Investigations with DDT in California, 1944. Univ. Calif. Agric. Expt. Sta. :18-22. (Processed).

1949. Notes on the occurrence of agromyzid flies during 1948, and a record of two unreported species in California. Pan-Pac. Ent., 25:91-92.

LANGE, W. H., JR., and L. M. SMITH

1947. Control of a leaf miner on peas. Jour. Econ. Ent., 40:496-499.

MEIJERE, J. C. H. DE

1925. Die Larven der Agromyzinen. Tijdschr. Ent., 68:273, 289.

MELANDER, A. L.

1913. A synopsis of the dipterous groups Agromyzinae, Milichinae, Ochthiphilinae and Geomyzinae. Jour. N. Y. Ent. Soc., 21:258.

SMITH, L. M. and W. H. LANGE, JR.

1946. Experiments with DDT and lead arsenate for controlling the pea leaf miner. Univ. Calif. Agric. Expt. Sta. Circ., 365:52-54.

BOOK NOTICE

Studies Honoring Trevor Kincaid. Editor, Melville H. Hatch. 167 pages, 13 plates. University of Washington Press, Seattle. 1950. Price, \$2.50.

In editing this publication, Professor Hatch has set an excellent example for a scientific tribute to a fellow scientist—a biography of the scientist, Professor Trevor Kincaid, a biography of one of his teachers, the history of a society with which Prof. Kincaid was intimately associated, and several zoological papers by his colleagues and former students.

Trevor Kincaid was born in Ontario, Canada, in 1872. He developed an interest in natural history at an early age, at first collecting fossils. At the age of 17, Kincaid moved to Olympia, in the Washington Territory, where his interest turned to entomology and botany. He soon established himself as an energetic collector; by the time he was 22 he had built up a collection of 60,000 specimens and sent over 100,000 specimens to specialists.

Kincaid attended the University of Washington and was given an appointment as an assistant in his second year. In 1901 he received his M.A. degree and was made professor of zoology. At one time or another he taught nearly every course in the department. In 1942 he continued on at a half-time basis and finally, in 1947, became professor emeritus.

His activities have been numerous and diversified, even though much of it has not been translated into written works. His first publication was on the dipterous family Psychodidae; he has described a species of diplopod, and has collected chalcid parasites of the gipsy moth. He accompanied David Starr Jordan to the Pribilof Islands of the Alaska Fur Seal Commission and he served as entomologist on the Harriman Alaska Expedition (the list and description of specimens fills two volumes). However, he is better known by the public for his works in the oyster industry than in entomology, having been largely responsible for the establishment of the oyster industry in the Willapa Harbor region, Washington. He has also been interested in fresh-water plankton and other invertebrate groups.

Professor Kincaid was awarded an honorary Doctor of Science degree by the College of Puget Sound and was the first graduate to be designated by the University of Washington Alumni Association *Alumnus Summa Laude Dignatus*. There are sixty-four plants and animals named in his honor from such groups as Spermatophyta, Foraminifera, Oligochaeta, Isopoda, Insecta, Pisces, and others.

The second portion of this publication, "An Account of the Life of Orson Bennett Johnson," is best summarized in Editor Hatch's own words. "Orson Bennett Johnson was one of the pioneer naturalists of the Pacific Northwest. From 1882 to 1892 he was professor of natural history at the University of Washington, and throughout a quarter of a century of invalidism that dated from the latter year he

built up an extensive insect collection that he gave to the University. Twelve years after his death he was honored by having a new biological laboratory building at the university named for him. The following pages have been written to preserve an account of his life—an account which, though all too brief, is as full as the limited data that are available permit.

“Professor Johnson’s major contribution was twofold. In the eighties he brought an enthusiasm for natural history to Seattle and to the University of Washington Territory. He was directly and, through the medium of the membership of the Young Naturalist’s Society, indirectly responsible for the distribution to the working specialists of important elements of his local fauna, especially in Mollusca, Decapoda, Lepidoptera, Coleoptera, Diptera, Arachnida, and Pisces—which material would have remained in a certain measure unknown to the scientific world, had it not been for his activities. Living in a pioneer community, without library facilities, in the midst of a strange fauna, he was, perhaps, very wise in constituting himself primarily a collector.”

The third section deals with the history of the Young Naturalists’ Society. This organization was founded in Seattle in 1879 and was devoted to the study of natural history. The members were amateurs and their meetings consisted chiefly of natural history studies by the members themselves with only a few outside speakers. As the Young Naturalists became older there was not enough new blood to take their place and consequently the Society passed out of existence between 1900 and 1905. The importance of the organization lies in the fact that it was the first group to make a study of the flora and fauna of the Washington Territory and continued this function until the various biological departments of the University of Washington had been established.

The remaining portion of the publication consists of scientific papers written by colleagues and former students of Professor Kincaid. They are as follows: “A comparative study of the thyroid follicle,” by S. E. Johnson; “The genotype and systematic position of *Sporadogenerina* Cushman (Foraminifera, Polymorphinidae),” by D. L. Frizzell; “Review of thirteen genera of South American fishes in the subfamilies Cynodontinae, Hepsetinae, and Characinae, with the description of a new *Cyrtocharax*,” by L. P. Schultz; “Early life history and larval development of some Puget Sound Echinoderms,” by M. W. & L. T. Johnson; “Some monogenetic trematodes of Puget Sound fishes,” by K. Bonham; “Methods for the study and cultivation of Protozoa,” by V. Tartar; “Conopisthine spiders (Theridiidae) from Peru and Ecuador,” by H. Exline; and “Some remarks on the blood volume of fish,” by A. W. Martin. Although the writer is in no position to pass judgment on these articles, they appear to be in keeping with the good character of the rest of the publication.—Larry W. Quate.

A SPECIMEN OF *HOPLOPSYLLUS ANOMALUS* (BAKER)
LACKING A PRONOTAL CTENIDIUM (SIPHONAPTERA)

HAROLD E. STARK¹

An anomalous male specimen of *Hoplopsyllus anomalus* (Baker, 1904) recently was observed while identifying fleas collected by plague survey units of the Western CDC Laboratory.

The pronotal ctenidium, normally present in this species, is entirely lacking and the pronotum is much reduced. The flea appears normal in every other respect and the forelegs appear to be functional. Therefore, it appears doubtful that this lack of a pronotal ctenidium resulted from a mechanical injury in larval life or during mounting. This leaves pathological or embryonic malformation as possible explanations. This anomaly in Siphonaptera is presented merely as a curiosity (Fig. 1).

This specimen of *H. anomalus* was collected 10 mi. E. of Beaver, 7,000 ft., Beaver Co., Utah, by H. C. Owen, May 6, 1949, host: *Citellus variegatus grammurus* (Say).

¹Medical Entomologist Communicable Disease Center, Public Health Service Federal Security Agency, Atlanta, Georgia. (From Western Communicable Disease Center Laboratory, San Francisco, California.)

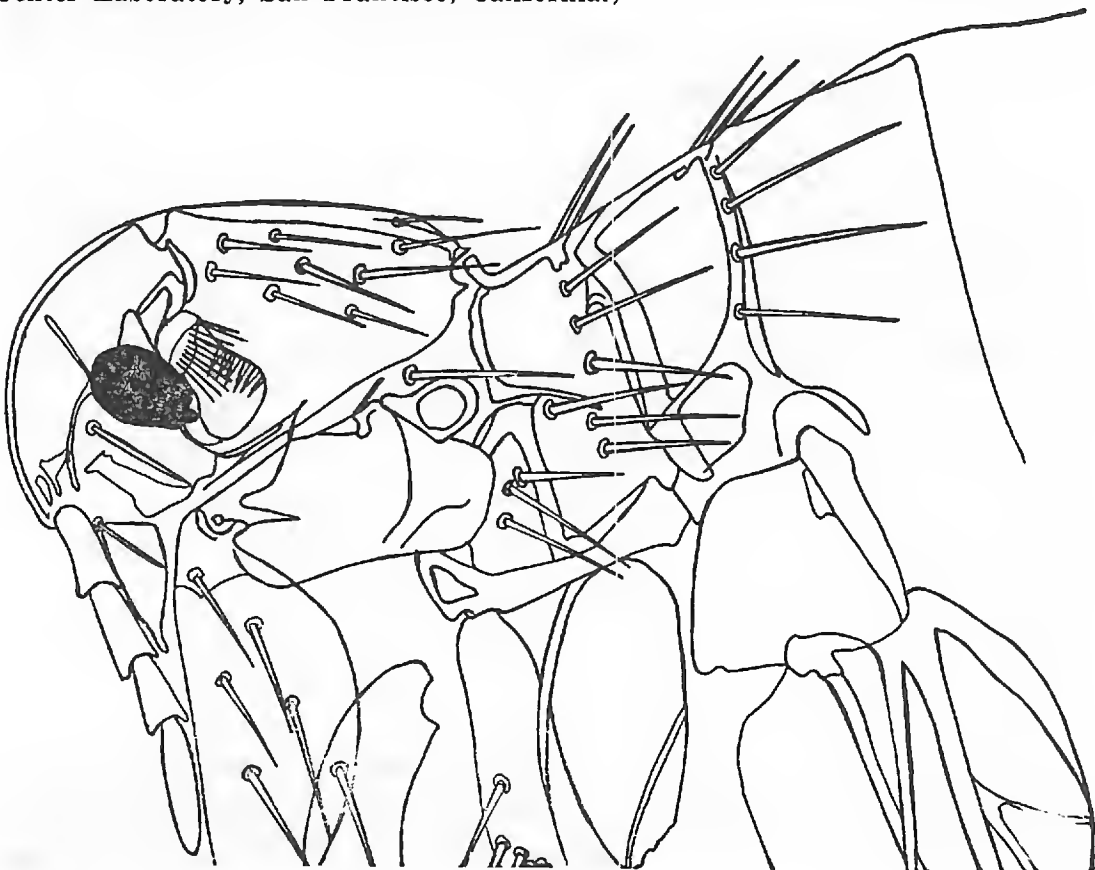


Fig. 1. *Hoplopsyllus anomalus* lacking ctenidial comb.

DETTOPSOMYIA AND PTILOMYIA: TWO GENERA NEW TO THE UNITED STATES

(Diptera: Drosophilidae; Ephydriidae)

MARSHALL R. WHEELER

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While making general collections of acalyptate Diptera in California and Texas in 1949-50, representatives of two genera not previously reported from this country were found. One of these seems to be relatively widespread and has probably been overlooked or not recognized by other collectors, while the other is more likely a recent introduction into this country from Australia.

DETTOPSOMYIA Lamb (Drosophilidae)

This genus, belonging to the Mycodrosophila-assemblage of genera, was described by Lamb (1914) for his new species *formosa* from the Seychelles. Malloch (1924) described *Drosophila nigrovittata* from Australia, remarking that the species appeared to belong to *Spuriostyloptera* Duda, an oriental genus. Malloch's description clearly shows, however, that *nigrovittata* is not referable to that genus but belongs to *Dettopsomyia*.

In October, 1949, the writer observed larvae and puparia in a rotting, bleeding area of about 20 sq. in. on a large banana plant on the grounds of the Pottinger Hospital in Monrovia, California. Adults were reared and, a short time later, a large number of adults were captured around this banana clump. These specimens matched the description of *D. nigrovittata* in every detail. A permanent colony seems to have become established in this area, since as late as March, 1950, it was a simple matter to collect additional specimens. A single specimen was also taken by sweeping along the Rio Hondo near Montebello, California. Attempts were made to establish a living culture of this species using the usual *Drosophila* culture media, but the stock was lost after about four generations.

It seems logical to assume that *Dettopsomyia nigrovittata* is a rather recent introduction since the area has in past years been well collected by Drs. A. L. Melander and A. H. Sturtevant, both specialists on Diptera. The finding of this Australian species in

California is especially interesting in view of Malloch's (1938) report of *Dettopsomyia formosa* being found in Hawaii in 1936.

In Curran's (1934) key to genera of North American Diptera, this genus will key to couplet 12 of the key to Drosophilidae, where it differs from the remaining genera by the following combination of characters:

Small species with a complex pattern of longitudinal stripes on the mesonotum; costal break exceptionally deep, the lobe well-developed, blackened, and bearing two strong bristles; 2nd and 3rd costal sections nearly equal (costal index about 1.0) *Dettopsomyia*

PTILOMYIA Coquillett (Ephydridae)

This genus, a member of the Psilopinae, was erected by Coquillett (1900) for his new species *enigma* from Porto Rico. No other species appear to have been described.

More than 70 individuals which appear to be identical with *Ptilomyia enigma* have been taken by sweeping along a small stream in Austin, Texas, in June, 1950. In view of its minute size (about 1 mm.) and its apparent non-rarity, it seems very probable that it has been collected by others but not identified or reported.

A single specimen of an undescribed species belonging to this genus was taken by the writer near Kernville, California, in April, 1950. This specimen, which is slightly larger than the *enigma* from Texas, also differs in having the tarsi about as dark as the rest of the legs and in having distinct dark clouds over the posterior cross-veins. It does not seem desirable to describe and name this species until further material becomes available.

The genus *Ptilomyia* keys correctly in Curran (*op. cit.*). In Cresson's (1942) synopsis of North American Ephydridae, it keys to *Atissiella* Cresson from which it can be separated as follows:

- Arista pectinate, without ventral branches; acrostichals in 2-6 rows, only the prescutellar pair enlarged..... *Atissiella*
- Arista plumose, with both dorsal and ventral branches; acrostichals in 2 sparse rows, several pairs noticeably enlarged.. *Ptilomyia*

REFERENCES

COQUILLETT, D. W.

1900. Report on a collection of Dipterous insects from Puerto Rico. Proc. U. S. Nat. Mus., No. 1198, 22:249-270.

CRESSON, E. T., Jr.

1942. Synopses of North American Ephydridae. Tr. Am. Ent. Soc., 68:101-128.

CURRAN, C. H.

1934. The Families and Genera of North American Diptera. Ballou Press, New York, N. Y. 512 pp.

LAMB, C. G.

1914. Reports of the Percy Sladen Trust Expedition. Diptera. Tr. Linn. Soc. London, 2 ser., 16:307-372.

MALLOCH, J. R.

1924. Notes on Australian Diptera. IV. Proc. Linn. Soc. N.S.W., 49:348-359.

1938. Two genera of Hawaiian Drosophilidae (Diptera). Proc. Haw. Ent. Soc., 10:53-55.

A NEW SUBSPECIES OF METATAENIA

(Coleoptera: Buprestidae)

JACQUES R. HELFER

Mendocino, California

Metataenia clotildae refulgens Helfer, *new subspecies*

Holotype, adult female. Length 25.5 mm., with 8.5 mm., elongate parallel, widest near base of elytra; head, pronotum, and elytra brilliant red with golden reflections, pronotum with a pair of yellow foveae laterally near the base, each elytron with five yellow or golden colored depressions, one medial at the base, two at the first third, one medial the other lateral, one fasciaform and medial at about the second third, and one near the suture at the apical fifth, these depressions becoming progressively shallower toward the apices which are metallic blue green; body golden green beneath. *Head* punctate; strongly excavated between the eyes and with a deep longitudinal groove medially in the bottom of the excavation; a strong carina forming the anterior boundary of this excavation, separating it from the strongly notched clypeus; eyes large, only slightly convergent posteriorly, rather strongly convex and noticeably protuberant, brown; jaws black near the tips but mostly metallic green and strongly punctate; antennae 11-segmented, reaching about to the hind angles of the pronotum, the first segment long, testaceous proximally, metallic green distally, second segment very short, third three times as long as second and equal in length to fourth, succeeding segments more thickly punctate, becoming progressively shorter and

broadener to the tip, terminal segment again a little longer and subquadrate, last ten segments black; genae and gula green. *Pronotum* finely sparsely punctate, widest at base, with base bisinuate, sides slightly sinuate at basal third then arcuate to front angles, narrowly longitudinally impressed medially, most deeply just before the scutellum; with a fovea at each side near the basal angle, limited externally by a strong upfold of the integument and angling forward toward the anterior angles, becoming rapidly shallower, with a sulphur like efflorescence lending a yellow color underlain by a distinct pubescence; hind angles sharp, front angles bent under, not visible from above. *Scutellum* green, transverse, almost rectangular. *Elytra* with longitudinal rows of small punctures; strongly sinuate laterally when viewed from the side; broadest near the base then slightly sinuate to about the middle, then broadly arcuate and achieving the second greatest width a little behind the middle, narrowing to the apices which are divaricated and end in spines, the last quarter of the margin being strongly toothed; lateral margin rather strongly reinforced with a ridge like thickening; depressed spots pubescent and (except the apical) bearing a yellow efflorescence. There is, in addition to the easily noticed depressions already mentioned, a slight depression which has a few hairs located just forward of the rounded humeral region. *Prosternal spine* punctate, slightly wider after passing between the anterior coxae, subtrilobate, not impressed medially, neatly delimited anteriorly from the remainder of the prosternum by a narrow transverse depression. *Abdomen* with large hairy areas anterolaterally on the segments; sparsely setopunctate elsewhere; last segment emarginate at the tip. *Legs* green, tibiae becoming testaceous distally, tarsi testaceous.

Holotype: Kieta, Bouganville Island, Solomon Islands, XII, 8 to 21-1938 (Van Dyke collection). The type series is part of a large number of specimens collected by the Papuan-Australian expedition of 1938-39, led by R. G. Wind. Type in the California Academy of Sciences (Ent.).

Variation: In a series of twenty-six specimens examined the size ranges from 19 to 25.5 mm. in length and from 6 to 8.5 mm. in width. The color of the dorsum becomes slightly purplish red in a few specimens. One specimen, labeled as part of this series, is green and quite typical of *Metataenia clotildae* (Gestro) sensu stricto, a typical specimen of which I have from Korido Island near New Guinea. Sexes similar.

M. clotildae was described originally as a *Paracupta* but differs from that genus in not having the prosternal spine medially impressed. The variety *M. clotildae cupreosplendens* (Kerremans) which was originally described as a species of *Paracupta* differs from *refulgens* as follows:

<i>cupreosplendens</i>	<i>refulgens</i>
Brilliant copper with greenish reflections	Brilliant red with golden reflections
Elytral depressions same color as background	Elytral depressions strongly contrasting with background color
Tibiae entirely testaceous	Tibiae metallic green proximally
New Hanover, Bismarck Archipelago	Bougainville I., Solomon Islands

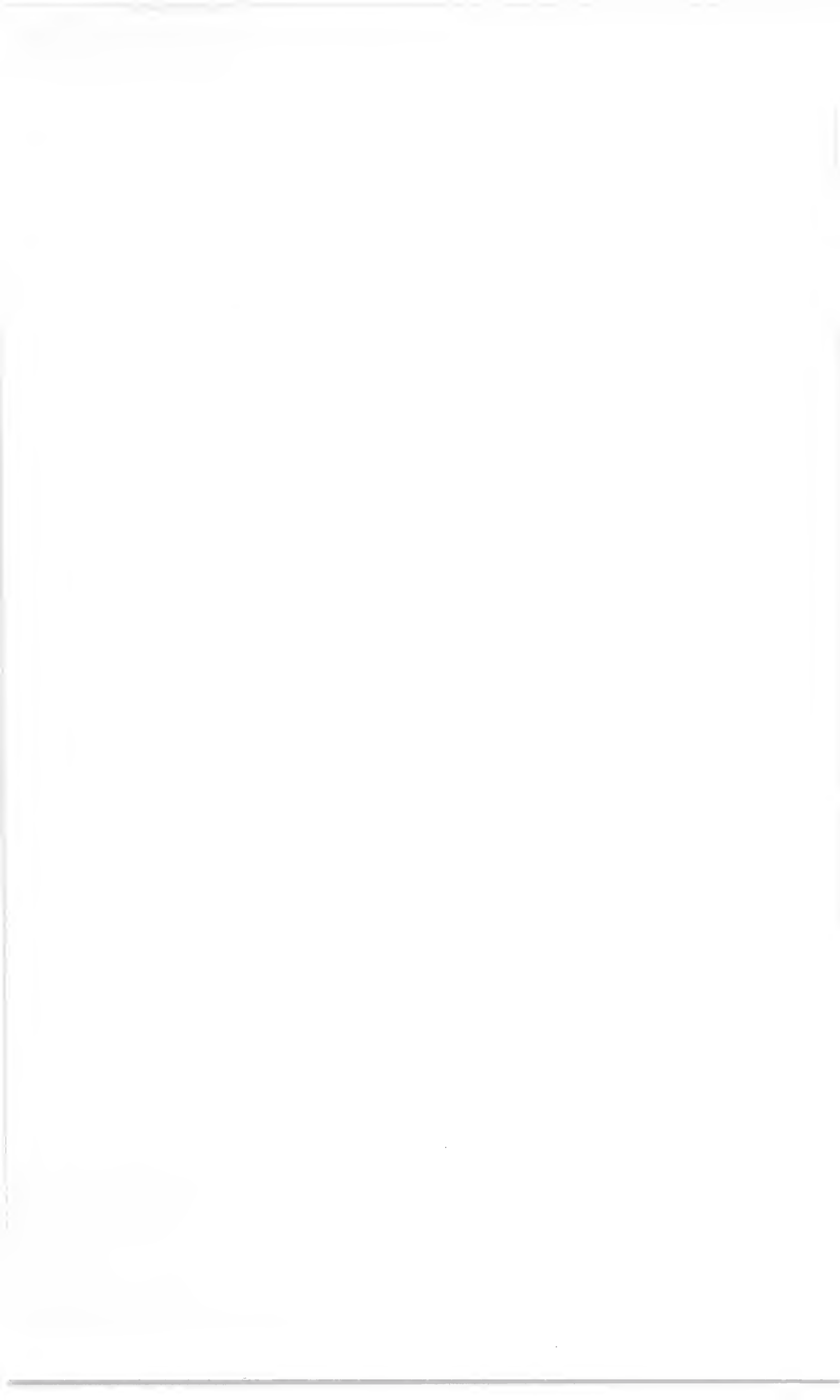
The other species of *Metataenia* are *M. insulicola* Théry, black and green with gold spots, from Russell Island, *M. quadrimaculata* Théry, bronze-brown with reddish gold spots, English New Guinea, *M. purpurascens* Théry, entirely purple, English New Guinea (Arfak Mts.), and *M. meeki* Théry, entirely bronzed with three powdery pits on the elytra, English New Guinea (Owgarra), all quite different from the present form.

The structure of *refulgens* is, apparently, identical with that of *clotildae* and so I am placing this form as a subspecies of the previously described form. I am following Théry in the use of the generic name *Metataenia* but it should be noted that these forms are very near to the genus *Iridotaenia*.

NEW RECORDS FOR STREBLIDAE AND NYCTERIBIIDAE

(Diptera: Pupipara)

The Streblidae and Nycteribiidae are essentially tropical families which extend up to the southern part of the United States. Jobling (Parasitology 30(3):363, 1938) states, "*Trichobius corynorhini* Cockerell (Streblidae) extends from Oklahoma through Colorado as far as 40° North in Utah and 37° North in California." One male of this species was taken from a bat, *Corynorhinus rafinesquii* (Lesson), probably subspecies *townsendii* (Cooper) at Roseburg, Ore., April 16, 1950, by the author. Two females and a male Nycteribiid, *Basilina forcipata* Ferris were collected August 9, 1940, at Redmond, Ore., from "bat" (collector unknown). Determinations were verified by Dr. J. Bequaert of the Museum of Comparative Zoology, Cambridge, Mass.—VINCENT D. ROTH.



THE PAN-PACIFIC ENTOMOLOGIST

Published by the
Pacific Coast Entomological Society
in cooperation with
The California Academy of Sciences

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San Francisco, California

1951

THE PAN-PACIFIC ENTOMOLOGIST

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Entered as second class matter, February 10, 1925, at the post office at San Francisco, under act of August 24, 1912.

The Pan-Pacific Entomologist

Vol. XXVII, No. 3

July, 1951

THE HISTORY OF THE PACIFIC COAST ENTOMOLOGICAL SOCIETY¹

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Founding and Early History

The first entomologists to visit California were those connected with the Russian expeditions and settlements: Johann Eschscholtz, Eduard L. Blaschke, and Ilya Gavrilovich Vosnesensky. During the pioneer period they were followed by Pierre Joseph Michel Lorquin, Dr. Hans Herman Behr, Henry Edwards and James Behrens, and soon after a host of others so that by the beginning of the twentieth century there were quite a number of entomologists in southern California and a larger number centered about San Francisco.

When Carl or Charles Fuchs came to San Francisco in 1884, his enthusiasm acted as a magnet to draw most of the local entomologists together, and his workshop on Kearny Street was the usual meeting place for most local and visiting entomologists. To still further unite the entomologists, Mr. Fuchs issued a call for a meeting, on August 7, 1901, to organize the California Entomological Club.

¹Based on contributions by E. O. Essig, P. D. Hurd, Jr., D. D. Jensen, H. B. Leech, E. G. Linsley, J. W. MacSwain, R. C. Miller, R. L. Usinger, and E. C. Van Dyke. The Society was founded 50 years ago, on August 15, 1901.

The first meeting convened at the California Academy of Sciences, on Market Street between Fourth and Fifth Streets, August 15, 1901. Mr. H. C. Fall acted as temporary president. The first Constitution and By-Laws of the Society were formulated and accepted at this meeting (Proceedings of the Pacific Coast Entomological Society, pp. 1-2). The following officers were elected: Charles Fuchs, President; Prof. Vernon Kellogg, Vice-President; Dr. F. E. Blaisdell, Secretary and Treasurer.

The following became Charter Members: Charles Fuchs, Edwin C. Van Dyke, Henry C. Fall, L. E. Ricksecker, H. H. Behr, W. G. W. Harford, Beverly Letcher, F. W. Nunenmacher, Wm. Ashmead, Edward M. Ehrhorn, James E. Cottle, F. E. Blaisdell, J. G. Grundel, C. A. Whiting, Newton B. Pierce, C. W. Herr, Geo. W. Harney, F. C. Clark, J. J. Rivers, L. O. Howard, Vernon Kellogg, L. Durstein, Alexander Craw, and the Grattum Naturalists Club of El Dorado, California, Sarah E. Harris, Secretary.

Some of the above, being but casually interested in the subject, soon dropped out. The majority, however, remained members as long as they lived. James E. Cottle, of Hayward, Calif., and E. C. Van Dyke are the only ones still living.

The name of the Society was changed at the fifth regular meeting on August 16, 1902, to the Pacific Coast Entomological Society, at the suggestion of Professor Trevor Kinkaid, who felt that it should not be kept a local society. As time went on, most of those who were interested in the subject of entomology on the Pacific Coast became members. The Society thus greatly extended its membership, including as it did those persons affiliated with the California Academy of Sciences, the University of California, Stanford University, the State Department of Agriculture and all local entomological agencies as well as the independent collectors and amateurs. Meetings were held at more or less regular intervals and, while Mr. Fuchs was President, generally at a German restaurant, where the formal meeting followed a social dinner. Later on they were held wherever quarters could be found, such as the private homes of the members.

At the time of the earthquake and fire, April 18, 1906, a considerable dislocation of the affairs of the members and Society took place. The main entomological collection of the California Academy was destroyed, only the types of the Lower California species from two expeditions being saved through the efforts of the botanist, Miss Alice Eastwood. The large and valuable Lepidoptera collec-

tion of Dr. Behr, which contained many types, was also completely destroyed. Of private collections, that of Mr. Fuchs which was at his quarters, 212 Kearney Street, was destroyed with the exception of a few boxes of his general collection which he personally carried to a place of safety. The Letcher and Cottle collections of Lepidoptera were also entirely destroyed. The Blaisdell collection, which was beyond the fire limits, suffered somewhat from the overturning of a couple of cases, while the Van Dyke collection, which was also beyond the fire limits, escaped. The Society records were in Dr. Blaisdell's possession, so were saved. Of out-of-town collections,



Fig. 1. Three charter members of the Pacific Coast Entomological Society. Left to right—F. E. Blaisdell, Sr., Chas. Fuchs, Beverly Letcher.

Ricksecker's suffered most. Mr. Ricksecker was at the time county surveyor of Sonoma County and his collection was stored at his offices in the court house at Santa Rosa; it was destroyed when that building was wrecked by the earthquake. Albert Koebele's collection was at his home in Alameda and remained uninjured; it contained, besides his own, the old Hartford collection and some material collected by O. T. Baron. Later the Hartford collection was sold to Mr. W. M. Giffard and was made a part of that of the Hawaiian Sugar Planters' Experiment Station, and in 1926 Mr. Koebele's own collection was presented to the California Academy of Sciences by his widow. Mr. J. J. Rivers at the time of the earthquake was living in Santa Monica and his collection was with him and of course saved. Later on, this was sold to Dr. Walther Horn of Berlin.

As soon as possible after the fire the entomologists again assembled, and continued with their entomological work, rebuilding their collections where destroyed and keeping alive the Society. Four months after the fire, the 21st meeting of the Society was held on the evening of August 25, 1906, at the residence of Miss Julia Wright, 2329 Pacific Avenue, Alameda. From this time on entomological interest not only continued but increased. The Academy's expedition to the Galapagos Islands was away at the time of the fire, but returned before the year was out, and Mr. F. X. Williams, the entomologist, was able to report upon the collections made.

Relation to the California Academy of Sciences

In the years immediately following the earthquake and fire the Society was entirely on its own. Meetings were held at the homes of its members or at some hotel or restaurant following a dinner. A few meetings were held at the Academy's temporary headquarters, 343 Sansome Street, in 1914 and 1915, and then for several years in the Board Room of the Mechanics' Institute at 57 Post Street. From 1924 to 1932 the State Department of Agriculture's office, Room 10 in the Ferry Building, served as a meeting place.

When the "West Wing" of the Academy's new housing in Golden Gate Park was opened in 1916, Society members began making donations to the collections and affiliating with the Academy, but it was not until the *Pan-Pacific Entomologist* was started in 1924 that the present close relations began. Space was given for records, magazines, etc., and a certain amount of typing was donated to the Society. In return, the *Pan-Pacific* advertised Academy publications.

The "East Wing" of the Academy was completed and the Department of Entomology took possession of its present quarters in the winter of 1931-1932. It was soon considered advisable to hold the Society's meetings in these rooms and the first was held there March 4, 1933. This was an excellent move and has been to the advantage of both parties. It has given a permanent meeting room to the Society and a place for the members to deposit their collections where they are available for study at all times. And to the Academy it has supplied many workers who have made the entomological department one of the most active in the institution, and its insect collection one of the finest in America, in the short space of 35 years.

Affiliations

At the 75th meeting of the Society, March 20, 1920, the members voted in favor of affiliating with the Pacific Division of the American Association for the Advancement of Science. The Pacific Division held its fourth Annual Meeting in Seattle, June 17-19, 1920, and the committee to consider acceptance of society affiliations met on June 17. At that time our Society became officially affiliated, or, as it was later termed upon revision of the constitution of the A.A.A.S., "associated".



Fig. 2. The first Field Day, held near Niles, Alameda County, California, May, 1902. Standing, left to right—J. C. Huguenin, J. E. Cottle, B. Letcher, C. Fuchs, E. M. Ehrhorn. Seated—F. W. Nunenmacher, L. E. Ricksecker, Walther Horn (Berlin), F. E. Blaisdell, Sr., F. X. Williams.—Photo loaned by E. C. Van Dyke.

A special meeting of the Pacific Coast Entomological Society was held in conjunction with that of the Pacific Division on June 18, 1920, with President E. C. Van Dyke in the chair; Mr. E. P. Van Duzee, Secretary *pro tempore*, and Professor Kincaid acting as local representative.

At the fifth Annual Meeting of the Pacific Division, A.A.A.S., in San Francisco, our Society was on the official program, and met in the auditorium of the California Academy of Sciences on August 6, 1921, President Van Dyke in the chair.

Because so many members of the Society are in the field during the summer months, the relationship with the Pacific Division of the A.A.A.S., which meets in the summer, has never been close. However, the 91st meeting was held with the Association on Sept. 11, 1923, at the University of Southern California, Los Angeles.

A summer meeting was held on June 19, 1934, in conjunction with the Entomological Society of America, the American Association of Economic Entomologists and the Lorquin Entomological Club at the University of California, Berkeley.

The Society was officially listed as a participant at the Fifth International Congress of Entomology, Paris (1932) (E. C. Van Dyke, delegate); at the Eighth International Congress of Entomology, Stockholm (1948) (R. L. Usinger, delegate); at the Thirteenth International Congress of Zoology, Paris (1948) (R. L. Usinger, delegate); and was represented by three of its members, E. C. Van Dyke, E. P. Van Duzee, and W. B. Herms, at the Fourth International Congress of Entomology, Ithaca (1928), and by S. B. Freeborn at the Eleventh International Congress of Zoology, Padua, 1930.

Incorporation

In 1940, due to the increased financial responsibilities of the Society, including administration of the Henry Clinton Fall Publication Fund, it seemed advisable to incorporate under the laws of the State of California. The Society was incorporated on September 11, 1940. The Articles of Incorporation, together with the By-Laws adopted at that time, were published in the *Pan-Pacific Entomologist*, vol. 18, No. 1, pp. 31-37 (1942). The corporation was formed "to promote, sponsor, foster and stimulate research in the field of entomology; to provide facilities and opportunities for research and analysis of any and all phases of entomology by lectures, forums, discussions, experiments, surveys, public meetings, exhibitions, courses, classes, conferences, symposia and analyses; to publish books, pamphlets, monographs and in general to disseminate information about entomology and the results of entomological research; to accumulate and record historical facts and materials relating to entomology in general; to give, grant and sponsor the granting of fellowships and awards for study or research in the field of entomology; and in general, to act as a medium for the exchange of information and knowledge and research in entomology between the members of this corporation and scientists and entomologists throughout the world."

Meetings

By custom, an annual field meeting has been held by the Society since its founding. The first Field Day was held in the vicinity of

Irvington and Niles, Alameda County, in May, 1902. The list of participants includes names well known in entomology during the past half century: Edw. Ehrhorn, Chas. Fuchs, James Cottle, Beverly Letcher, F. W. Nunenmacher, F. C. Clark, L. E. Ricksecker, J. C. Huguenin, F. E. Blaisdell, F. X. Williams, and Dr. Walther Horn of Berlin.

In spite of the uncertainties of spring weather, the annual field trip has remained as a highlight of the year's activities, though in recent years emphasis has shifted more to the social than to the scientific side. This is perhaps attributable to the fact that areas near enough to be conveniently accessible are now comparatively well known entomologically.



Fig. 3. Field Day at Fairfax, Marin County, California, June 11, 1905. Left side, from the rear forward and from left to right—F. W. Nunenmacher, Von Geldern, J. C. Huguenin, J. E. Cottle (in cap), F. X. Williams, F. E. Blaisdell, Sr., C. Fuchs, F. E. Blaisdell, Jr. At the table—Mrs. C. Fuchs. Right side—E. C. Van Dyke, Mrs. J. E. Cottle, Miss Julia Wright, Miss Bessie Wright, Miss Mary Moser, Mrs. Anna Blaisdell, Mrs. F. E. Blaisdell, Sr., Mrs. J. C. Huguenin.—Photo loaned by E. C. Van Dyke.

It has also become traditional to devote the first meeting of the fall to reports by members of their summer collecting experiences. These reports provide a vast fund of information as to collecting conditions throughout the Western United States in years past. These and the observations reported by members at regular meetings are a major contribution of our entomological society.

In recent years still another of the meetings has been set aside for a special purpose. The December meeting is now referred to as the annual business meeting and is the occasion for election of officers and for delivery of an address by the retiring president.

Committees

The four standing committees of the Society are Program, Membership, Publication and Historical. The work of the Program Committee speaks for itself on every page of the Proceedings. Membership and Publications are discussed elsewhere in this account.

A special Nomenclature Committee represents us in matters of zoological nomenclature. Early in World War II, at the request of the Society, the Nomenclature Committee (*Pan-Pacific Ent.* 18 (1):43-45, 1942) drafted a proposal for a "Committee on Entomological Nomenclature". This timely move promoted the formation of the joint committee on scientific nomenclature in entomology at the meetings of the Entomological Society of America and the American Association of Economic Entomologists in San Francisco, December, 1941 (*Pan-Pacific Ent.* 18(3):144, 1942).

The Historical Committee has been concerned chiefly with the accumulation and preservation of historical materials. These include 1) minutes and records of the Society, 2) correspondence, field notes, and newspaper clippings, and 3) photographs. Although these materials are the property of the Society, there is a close liaison with the entomological department of the California Academy of Sciences, where the materials are stored in a steel filing case. In addition to Society records the historical file contains a general accumulation of historical material for the western United States, especially in relation to entomologists and the collections that they have presented to the Academy.

The minutes of the Society's meetings are in several books. In addition there are hand-written and mimeographed programs of meetings, and reports on them, the basis for the published Pro-

ceedings. All these show clearly our debt to the late F. E. Blaisdell, Sr., for 27 years the Secretary.

The old letters include many from W. H. Edwards to W. G. Wright; Albert Koebele's correspondence, much of it from C. V. Riley and L. O. Howard; parts of the correspondence of J. J. Rivers, A. Fenyes, E. P. Van Duzee, F. W. Nunenmacher, and F. E. Blaisdell; a valuable file from L. I. Hewes, largely referring to his collection of Lepidoptera now at the Academy; letters and manuscript notes by Isabel McCracken; and the entomological correspondence of Ralph Hopping, fairly complete for a period of over 40 years, relating to his collection of Coleoptera which is also in the Academy. Lastly there is a bound, mounted collection of letters written by E. O. Essig to A. E. Michelbacher, during the former's European trip, 1936-1937.

There are valuable books of field notes, insect life-histories, and records of travel, the work of Albert Koebele, F. X. Williams, E. P. Van Duzee and Thomas Craig. These volumes contain much unpublished data. Most of the newspaper clippings came from Koebele, but some are of recent date.

The photographs include pictures of members of our Society, other western students, entomologists from various parts of the world (chiefly in the Koebele material), and an album of pictures taken abroad by C. L. Fox. Fortunately a majority of the photographs are identified.

The Proceedings

The Society first considered reproducing its Proceedings as early as the fifth meeting, August 16, 1902, at which time F. E. Blaisdell proposed that a mimeograph machine be purchased for this purpose. No action on this matter is recorded in the minutes, but the old mimeographing machine which he later used to produce notices and reports of the meetings, is still extant.

At the thirty-eighth meeting, December 3, 1910, "it was voted to raise the dues to \$1.00 a year in order to accumulate funds for publishing the Proceedings of the Society at the end of each year."

The first record of a "Committee on Publication" appears on page 1 of the Proceedings with Frank E. Blaisdell, *Editor*, Edwin C. Van Dyke, and Creighton Wellman. The only mention of this committee in minutes of the meetings is at the sixty-fifth meeting, September 1, 1917 when L. R. Reynolds was appointed "in place of Dr. Creighton Wellman, who has been absent for several years."

The Proceedings of the first to 47th meetings of the Pacific Coast Entomological Society (called the California Entomological Club for meetings 1-5) were published in abstract form in the section "Doings of Societies," in the journal *Entomological News*. These appeared as follows: First meeting, *Ent. News*, 12:243, Oct., 1901; second, 13:31-32, Jan., 1902; third, 13:199-202, June, 1902; fourth, 13:265, Oct., 1902; fifth, 13:333-334, Dec., 1902; sixth, 14:59-60, Feb., 1903; seventh, 14:165-166, May, 1903; eighth, 14:276, Oct., 1903; ninth, 15:43-44, Jan., 1904; tenth, 15:107-108, Mar., 1904; eleventh, 15:223-224, June, 1904; twelfth, no meeting; thirteenth, 15:348-349, Dec., 1904; fourteenth, 16:95-96, Mar., 1905; fifteenth to seventeenth, 17:104-106, Mar., 1906; eighteenth and nineteenth, 17:226-227, June, 1906; twentieth and twenty-first, not published; twenty-second and twenty-third, 18:259-260, June, 1907; twenty-fourth and twenty-fifth, no meetings; twenty-sixth to twenty-eighth, 19:499-500, Dec., 1908; twenty-ninth to thirty-first, 20:330-332, July, 1909; thirty-second, no meeting; thirty-third to thirty-fifth, 21:431-433, Nov., 1910; thirty-sixth, not published; thirty-seventh to thirty-ninth, 23:89-91, Jan. 31, 1912; fortieth, not held; forty-first to forty-fourth, 24:38-42, Dec. 31, 1912; forty-fifth to forty-seventh, 25:380-383, Sept. 30, 1914; forty-eighth, not held.

No record was kept of the dates of publication of the early numbers of the Proceedings (F. E. Blaisdell, personal communication, several years prior to his death). We can only say that between February 25, 1911 (the last meeting date of the first of the annual, unnumbered parts) and February 14, 1921 (the date of receipt of copies in the Library of The American Entomological Society, *vide* Mrs. Venia T. Phillips, *in litt.*, 1951) the first two parts of volume 1 (pp. 1-30) and the Proceedings of the 37th to 76th meetings were published. Since publication of abstracts continued in *Entomological News* through October 1914, it might be that publication by the Society was delayed that long. In any event, starting with the thirty-seventh meeting, August 20, 1910, Proceedings were published as separate, unnumbered parts with pages also unnumbered, each part starting with the first meeting in the Fall and ending with the last meeting in the Spring (usually the field meeting). The years 1910 to 1920 were covered in this way, and publication dates can only be assumed to have been after the date of the last meeting reported in each part.



Fig. 4. Field Day at Muir Woods, Marin County, California, May 17, 1908. Standing, left to right—J. C. Huguenin, G. R. Pilate, W. Topp, C. Fuchs, (unidentified), Mrs. Fuchs, Mrs. A. Blaisdell, L. Munier ?, P. Baumberger, F. X. Williams. Seated, left to right—E. C. Van Dyke, Mrs. F. E. Blaisdell, (unidentified), F. E. Blaisdell, Jr., J. G. Grundel (kneeling), Mrs. Huguenin, F. E. Blaisdell, Sr., E. T. Cresson, Jr.—Photo loaned by F. X. Williams.

The first to thirty-sixth meetings present a separate problem. These Proceedings were presumably published after the start of the above-mentioned unnumbered series, since the pages are numbered consecutively from 1 to 77. The separate parts are not numbered but are stapled as follows: pp. 1-16, 17-29, 31-44, 47-76, 77. Assuming that these were published in order, they all must have appeared after March 1, 1911 (see footnote, p. 3). Pages 1 to 30 were received at the Library of the American Entomological Society on February 14, 1921, and pages 31-46 on Feb. 19, 1924, 47-76 on Sept. 26, 1924, and page 77 on Aug. 8, 1927. The latter were not listed in Catalogue 12 published by John D. Sherman, Jr., in May, 1922, but (excepting p. 77) were noted as "all published to date" in Catalogue 19, Nov. 1924 (*vide* John D. Sherman, Jr., *in litt.*, 1951). Pages 47 to 76 were printed in early September, 1924, and the signature was distributed at the 95th meeting on September 13 (see Vol. 2, No. 4, top of p. 48).

Volume 2 continued the annual parts, each part covering the academic rather than calendar year, from the eighty-first to the one hundred and twenty-first meetings, 1921 to 1930, 9 parts, 131 pages. Only two of these parts are dated (fortunately, the two parts which contain descriptions of new species). These are No. 1, pp. 1-14, Nov. 15, 1922, and No. 2, pp. 15-34, Jan. 31, 1924. Numbers 3 to 9 can only be assumed to have been published after the date of the last meeting mentioned.

Dates of receipt of the various parts discussed above at the Library of the American Entomological Society, Philadelphia, Pa., are indicated in Table 1. Members of the Pacific Coast Entomological Society and all those who have occasion to use its Proceedings are deeply indebted to the authorities of the American Entomological Society and the Academy of Natural Sciences of Philadelphia for the assistance in publishing its Proceedings rendered during the early days of our Society and, in later years, for the meticulous recording of dates of receipt of the publications of our Society. To Mrs. Venia T. Phillips, Librarian for both the Philadelphia Academy and the American Entomological Society, in particular, we are indebted for extracting the data listed in Table 1.

In addition to the data already mentioned, Mrs. Phillips writes, "We also have mimeographed copies of Proceedings of the meetings 27th to 29th, pages 1-10, and of meetings 30th to 31st, pages 1-7. On the top of the 30th to 31st Proceedings is a pencilled notation these minutes were reissued in printed form with slight alterations."

Starting with the 122nd meeting, the Proceedings were published in the Society's journal, the *Pan-Pacific Entomologist*, as follows: meetings 122-125, *Pan-Pacific Ent.* 8:185-190, Sept. 19, 1932; meetings 126-128, 10:45-47, Mar. 31, 1934; meetings 129-135, 11:185-189, Jan. 10, 1936; meetings 136-139, 13:141-144, Sept. 14, 1937; meetings 140-143, 14:46-48, Mar. 12, 1938; meetings 144-145, 14:191-192, Nov. 15, 1938.

From meeting 146 to date the Proceedings have appeared regularly on the last pages of the January issue of each year for the period covered by the preceding calendar year.

The Proceedings, as noted above, contain minutes of the meet-

ings. They also contain abstracts of papers presented at the meetings. Of more importance to bibliographers are the formal papers which were published, especially in the earlier numbers. These include, among others, Fenyès, A.—Aleocharinae from the Aleutian Islands (43rd meeting, April 20, 1912; 4 pp.); Fall, H. C.—New species of Coleoptera from Humboldt County, California (Vol. 2, No. 1, pp. 12-14; Nov. 15, 1922); Van Duzee, E. P.—A new ceratocombid from Mexico (Vol. 2, No. 2, pp. 33-34; Jan. 31, 1924); Spencer, G. J.—An ear-wig new to British Columbia (Vol. 2, No. 4, pp. 65-66, read at the 99th meeting, June 17, 1925); Van Dyke, E. C.—Secondary sexual characters of the Coleoptera (Vol. 2, No. 5, pp. 75-84, read at the 102nd meeting, Dec. 12, 1925).

TABLE 1

DATES OF RECEIPT OF PARTS OF THE PROCEEDINGS OF THE PACIFIC COAST ENTOMOLOGICAL SOCIETY AT THE LIBRARY OF THE AMERICAN ENTOMOLOGICAL SOCIETY, PHILADELPHIA, PENNSYLVANIA

<i>Part</i>	<i>Meetings</i>	<i>Pages</i>	<i>Date</i>
(Vol. 1, No. 1)	1st to 12th	1 - 16	Feb. 14, 1921
(No. 2)	13th to 16th	17 - 30	Feb. 14, 1921
(No. 3)	17th to 20th	31 - 46	Feb. 19, 1924
(No. 4)	21st to 35th	47 - 76	Sept. 26, 1924
(No. 5)	36th	77	Aug. 8, 1927
(No. 6)	37th to 40th	8 unnumbered	Feb. 14, 1921
(No. 7)	41st to 44th	12 "	Feb. 14, 1921
(No. 8)	45th to 48th	7 "	Feb. 14, 1921
(No. 9)	49th to 52nd	7 "	Feb. 14, 1921
(No. 10)	53rd to 56th	1 - 12	Feb. 14, 1921
(No. 11)	57th to 60th	7 unnumbered	Feb. 14, 1921
(No. 12)	61st to 64th	11 "	Feb. 14, 1921
(No. 13)	65th to 68th	8 "	Feb. 14, 1921
(No. 14)	69th to 72nd	6 "	Feb. 14, 1921
(No. 15)	73rd to 76th	11 "	Feb. 14, 1921
(No. 16)	77th to 80th	13 "	Dec. 7, 1922
Vol. 2, No. 1	81st to 85th	1 - 14	Dec. 7, 1922
No. 2	86th to 89th	15 - 34	Feb. 19, 1924
No. 3	90th to 94th	35 - 46	Mar. 14, 1925
No. 4	95th to 99th	47 - 66	June 16, 1926
No. 5	100 to 104	67 - 88	Apr. 8, 1927
No. 6	105 to 109	89 - 100	Mar. 2, 1928
No. 7	110 to 113	101 - 112	Feb. 15, 1929
No. 8	114 to 117	113 - 124	Jan. 31, 1930
No. 9	118 to 121	125 - 131	Feb. 6, 1931

The Pan-Pacific Entomologist

The first effort to provide a journal representative of the entomological work being done on the west coast was made by the Pacific Coast Entomological Society during the first world war (Proceedings, 66th meeting, December 15, 1917). The publication was to be called the Pacific Coast Entomologist, but had to be abandoned owing to the uncertain conditions prevailing at that time. Seven years later, on June 25, 1924, the Society issued the first number of its journal—*The Pan-Pacific Entomologist*, under the editorship of E. P. Van Duzee with E. C. Van Dyke as associate editor and F. E. Blaisdell as treasurer. The Publications Committee consisted of E. O. Essig, chairman, G. F. Ferris, E. C. Van Dyke, R. W. Doane, Grant Wallace, W. W. Henderson and J. C. Chamberlin.

Changes in the management of the journal in the course of the past quarter century were—Editor: E. P. Van Duzee, 1924-1939; R. L. Usinger, 1939-1943; E. G. Linsley, 1943-1946; R. L. Usinger and E. G. Linsley, co-editors, 1946-1950; P. D. Hurd, Jr., and H. B. Leech, co-editors, 1950--. Treasurer: F. E. Blaisdell, 1924-1926; S. B. Freeborn, 1926-1931, E. R. Leach, 1932-1942; R. C. Miller, 1943--.

From the start, the *Pan-Pacific Entomologist* though officially the organ of the Pacific Coast Entomological Society, was published in close cooperation with the California Academy of Sciences. This cooperation has included contributing the time of the editors during the early years of publication, the time of the treasurer in recent years, and such other tangibles as financial assistance, help in mailing, and storage. In return, the Academy has enjoyed the benefits of the cooperative effort, many papers based on Academy collections have been published in the *Pan-Pacific Entomologist* and, more often than not, types of new species described in the Journal have been deposited in the Academy's collection.

Other direct benefits to the Academy include the journals which the Society receives in exchange for the *Pan-Pacific Entomologist* and the books received for review by the editors. Twenty-three journals from 16 countries are received in exchange for the *Pan-Pacific Entomologist*. Since the Society does not maintain a library, all such exchanges are turned over to the library of the California Academy of Sciences and entomological items are placed on the

shelves in the Department of Entomology. The Society is thus saved the expense of housing, cataloging and looking after this literature, though it is readily available to both resident and visiting members. The Academy's library thus gains periodicals having a subscription value of some \$75.00 a year.

The contributions to the *Pan-Pacific Entomologist* by the University of California, though less formal, have been consistent over the years. Direct assistance included the time of the treasurer, business manager, and the editors at various periods and secretarial assistance in connection with the above activities.

Of particular value to the journal during the recent period of rising costs has been the work of the advertising manager, A. E. Michelbacher. The mutually beneficial relationships between the Society and advertisers is especially appreciated by members and subscribers.

Now in its 27th volume, the *Pan-Pacific Entomologist* has published over 5,000 pages of original entomological work—mostly on insects of western North America and the Pacific Basin. Having passed the quarter-century mark, the journal can be said to have served well the purpose of its founders as “a regular entomological periodical which shall adequately represent the work being done in the west” and to have proved really worthy of its rather ambitious sounding title of *Pan-Pacific Entomologist*.

Henry Clinton Fall Memorial Publication Fund

The Henry Clinton Fall Memorial Publication Fund (*Pan-Pacific Ent.*, 17(1):33, 1941) was established by the Society as the result of a gift of securities from Mrs. Carl A. Richmond, sister of the late Henry Clinton Fall (*Pan-Pacific Ent.* 16(1):1-3, 1940, Plate), distinguished Coleopterist and charter member of the Society. Under the terms of the gift, the fund is administered by the Board of Directors of the Society through the Publication Committee. Mrs. Richmond generously permitted the Society freedom of action both in the administration of the fund and the subject matter covered by the publications to which it is applied.

The Society has felt that this fund should form the nucleus of an endowment fund, the proceeds to be used for publication of monographs which are too long for the *Pan-Pacific Entomologist*. The first volume of the new “Memoirs” series is currently being published.

Officers, Members and Trends in Membership

The original articles of organization stated that the officers of the Society shall consist of a president, vice-president, secretary and treasurer and such committees as are deemed necessary. The names of the officers and the years of their service are listed below. Dr. E. C. Van Dyke was elected honorary president for the semi-centennial year, 1951.

OFFICERS

<i>Years</i>	<i>President</i>	<i>Vice-President</i>	<i>Secretary</i>	<i>Treasurer</i>
1901-1907	Charles Fuchs	Vernon Kellogg	F. E. Blaisdell	
1908-1927	E. C. Van Dyke	(Various)	F. E. Blaisdell	
1928-1931	E. C. Van Dyke	G. F. Ferris	J. O. Martin	
1932-1933	G. F. Ferris	E. O. Essig	J. O. Martin	
1934-1935	E. O. Essig	H. E. Burke	J. O. Martin	
1935-1936	E. O. Essig	C. D. Duncan	E. G. Linsley	
1937-1938	C. D. Duncan	R. L. Usinger	E. G. Linsley	
1939-1940	E. G. Linsley	H. M. Armitage	P. C. Ting	E. R. Leach
1941	E. O. Essig	H. M. Armitage	E. G. Linsley	E. R. Leach
1942	H. M. Armitage	H. H. Keifer	E. G. Linsley	E. R. Leach
1943	H. H. Keifer	M. A. Stewart	E. G. Linsley	R. C. Miller
1944	M. A. Stewart	F. P. Keen	E. G. Linsley	R. C. Miller
1945	F. P. Keen	C. D. Duncan	E. G. Linsley	R. C. Miller
1946	C. D. Duncan	E. G. Linsley	E. S. Ross	R. C. Miller
1947	E. L. Kessel	A. E. Michelbacher	E. S. Ross	R. C. Miller
1948	A. E. Michelbacher	E. S. Ross	D. D. Jensen	R. C. Miller
1949	E. S. Ross	G. F. Ferris	D. D. Jensen	R. C. Miller
1950	G. F. Ferris	R. L. Usinger	D. D. Jensen	R. C. Miller
1951	R. L. Usinger	E. O. Essig	D. D. Jensen	R. C. Miller

The first president, Charles Fuchs, served for seven years. He was followed by Dr. Edwin C. Van Dyke who was president for 23 consecutive years from 1908 through 1931. From 1932 to 1940 the presidents served for either two or three years and since that time the office has changed annually. The first secretary-treasurer, Dr. F. E. Blaisdell, served for 27 years.

The Society was organized in 1901 with 23 charter members. It is of interest that the majority of the charter members were not professionally engaged in entomology, but collected and studied insects in their spare time for the pleasure they derived from their avocation. Only five, William Ashmead, Edward M. Ehrhorn, L. O. Howard, Vernon Kellogg and Alexander Craw, were professional entomologists. The others represented a variety of vocations and included several doctors.

In the intervening years the ratio of professionals to amateurs has changed until at the present time most of the members are either employed in entomology or are students preparing themselves for professional careers in entomology. Although the proportion of members whose activity in the field must be confined to their leisure hours has diminished, the amateurs continue to make

valuable contributions to the subject of entomology and to the program of the Society.

During the fifty years since its organization, 477 people have been elected to membership in the Society. Table 2 summarizes for each decade since 1901 the number of new members, the average number of meetings held a year and the average attendance a meeting. The list of active members in 1951 stands at 248.

TABLE 2

SUMMARY OF NEW MEMBERS, AVERAGE NUMBER OF MEETINGS HELD A YEAR AND AVERAGE ATTENDANCE A MEETING FOR EACH DECADE FROM 1901 THROUGH 1950

Time Period	New Members	Average Number Meetings a Year	Average Attendance a Meeting
1901 - 1910	66	3.3	17
1911 - 1920	33	3.8	17
1921 - 1930	54	4.5	20
1931 - 1940	106	4.0	26
1941 - 1950	203	5.1	35 ¹

¹Average attendance a meeting during 6 non-war years.....47

Average attendance a meeting during 4 war years.....16

Attendance at meetings has increased from an average of 17 during the first decade to an average of 35 during the 1941-1950 period. Moreover, for six years of the last decade attendance a meeting average 47. During the other four years the average was only 16 because so many members were in war service. The year 1948 saw the greatest numerical participation with 65 new members and an average attendance a meeting of 55 members and friends.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

*Roster of Persons Who Hold or Have Held Membership**

'42 Aarons, Theodore	'45 Allen, Robert P.
'50 Abram, Howard	'15 Ames, Mary
'48 Adams, C. F.	'29 Annand, P. W.
'48 Adams, Don W.	'49 Applegarth, A. G.
'47 Adams, P. A.	'38 Armitage, H. M.
'37 Aitken, Thomas G.	'47 Arnaud, P. H.
'05 Akins, Maggie	Ch Ashmead, Wm.
'44 Allen, Merlin W.	'36 Atkins, Clifford H.

*Ch - Charter member (1901). LM - Life member. HM - Honored member. HonM - Honorary member. [Names in capital letters Honored or Honorary membership.] Footnotes refer to death notices (Notice) and obituaries (Obit.) published in the *Proceedings* of the Pacific Coast Entomological Society and in the *Pan-Pacific Entomologist*.

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|-----------------------------|--------------------------------------|
| '49 Atkins, Ferne E. | '25 BRUNER, LAWRENCE |
| '48 Augustson, G. F. | (HonM., '35) |
| '47 Bacon, Oscar G. | '47 Bryan, Douglas E. |
| '35 Bailey, S. F. | '49 Bryant, Owen |
| '48 Baker, James | '50 Brydon, Harold A. |
| '29 Baldwin, Paul H. | '04 Burke, C. V. |
| '48 Barber, H. G. | '21 Burke, H. E. |
| '48 Barber, Herbert S. | '23 Cain, Brighton C. |
| '40 Barnes, Martin M. | '37 Cameron, Alan D. |
| '40 Barr, W. F. | '21 Campbell, Roy E. |
| '27 Barret, R. E. | '04 Carnes, E. K. |
| '39 Bartges, Rex | '48 Carter, G. F. |
| '37 Bartlett, B. R. | '48 Castillo, Roberto Levi |
| '20 Basinger, A. J. | '35 Cazier, Mont A. |
| '48 Bauman, Wilfred K. | '20 Chamberlin, J. C. |
| '05 Baumberger, Percy | '41 Chandler, Harry P. |
| '48 Beal, R. S., Jr. | '46 Chandler, La June Dunn |
| '42 Beer, Frank | '03 Chapman, Bertha |
| '47 Beer, Robert E. | '02 Chapman, Wm. |
| Ch Behr, H. H. | '41 Chong, Wing You (LM) |
| '48 Benedict, Stanley H. | '40 Christensen, L. D. |
| '50 Bentinck, William C. | Ch Clark, F. C. |
| '48 Bequaert, J. C. | '01 Clark, Mrs. F. C. |
| '01 Berger, L. E. | '36 Clark, John C. |
| '29 Bertrand, J. | '03 Clark, W. T. |
| '47 Bixby, D. H. | '44 Cockerell, T. D. A. ³ |
| '29 Blackwelder, Richard E. | '48 Cody, L. R. |
| '37 Blair, Millard F. | '19 Cole, Frank R. |
| Ch BLAISDELL, F. E | '01 Coleman, George A. |
| (HonM., '38) ¹ | '48 Coleman, Richard W. |
| '47 Blakemore, Herbert | '23 Comstock, John A. |
| '47 Boddy, Dennis W. | '49 Cook, Ediom F. |
| '35 Bohart, George E. | '49 Cook, Thomas W. |
| '35 Bohart, Richard M. | '06 Coolidge, C. K. |
| '34 Boyce, Janet Mabry | '39 Cope, Oliver B. |
| '37 Boyer, L. Bryce | '41 Cott, H. Edwin |
| '07 Bradley, J. C. | Ch Cottle, James E. |
| '51 Braff, Edythe B. | '49 Coy, L. P. |
| '13 Breeze, William F. | Ch Craw, Alex. |
| '04 Bremner, O. E. | '08 Cresson, E. T., Jr. |
| '40 Brereton, A. W. | '46 Culver, B. Dwight |
| '10 Bridwell, J. C. | '26 Curry, John F. |
| '39 Brookman, Bernard | '39 Dahl, R. G. |
| '24 Brosius, Fred C. | '48 Davidson, W. M. |
| '48 Brown, F. Martin | '24 Davis, Alonso C. |
| '36 Brown, Phyllis | '49 Davis, Donald W. |

¹BLAISDELL—Notice, P-P.E. 22(3):99. 1946. Obit. 23(2):49-58, pl. 1947.

²BRUNER—Notice, P-P.E. 13(1-2):68. 1937.

³COCKERELL—Notice, P-P.E. 24(1):8. 1948. Obit., 24(3):117-121, pl. 1948.

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|-------------------------------------|----------------------------------|
| '46 Davis, Edgar W. | Ch Fall, H. C. ⁷ |
| '31 Davis, Theoron | '36 Ferguson, George |
| '48 Day, W. C. | '46 Ferguson, William E. |
| '35 Daybell, Elwyn
(see Dorman) | '19 FERRIS, G. F. (HM, '48) |
| '44 Deaver, A. L. | '51 Figg-Hoblyn, John |
| '36 DeBach, Paul | '47 Fisher, T. W. |
| '35 DeLeon, Donald | '41 Fleschner, Charles A. |
| '46 Dethlefsen, E. S. | '41 Flock, R. A. |
| '20 De Vise, C. J. | '09 Fox, Carroll |
| '36 Dickson, R. C. | '12 Fox, Charles L. ⁸ |
| '19 Dietrich, Henry | '20 Frank, Arthur |
| '50 Dixon, Elbert B. | '36 Fraser, Isabelle |
| '24 Doane, R. W. ⁴ | '40 Frazier, N. W. |
| '44 Donohoe, Heber C. | '25 Freeborn, Stanley B. |
| '35 Dorman, Elwyn Daybell | '34 Freitag, J. H. |
| '29 Doudoroff, Michael | '41 Frick, Kenneth E. |
| '47 Douth, R. L. | '48 Fritz, Roy F. |
| '37 Downes, J. A. | '46 Frizzell, Harriet E. |
| '50 Downing, C. A. | '36 Frost, Florence |
| '43 Drake, Carl J. | Ch Fuchs, Charles ⁹ |
| '48 Dreisbach, R. R. | '36 Furman, Deane P. |
| '41 Driver, Fred J. | '33 Furniss, R. L. |
| '37 DuBois, J. J. | '40 Furry, F. W. |
| '20 Duncan, Carl D. | '44 Galindo, Pedro |
| '46 Duncan, Douglas K. | '17 Garnett, Richard T. |
| '47 Duncan, J. Bruce | '46 Gentner, L. G. |
| '46 Dunn, La June
(see Chandler) | '50 Gerhardt, P. D. |
| Ch Durstein, L. | '48 Gillaspy, James E. |
| '46 Eads, Clark O. | '46 Gillogly, Lorin R. |
| '02 EASTWOOD, ALICE
(HonM., '12) | '37 Gisla, Benedict G. |
| '41 Eaton, C. B. | '24 Gladstone, J. B. |
| '48 Edwards, J. Gordon | '38 Good, N. E. |
| '48 Ehrenford, Frank A. | '48 Gould, Douglas J. |
| Ch Ehrhorn, Edward M. ⁵ | '49 Graf, Otto W., Jr. |
| '49 Elishewitz, Harold | '46 Grant, C. Donald |
| '48 Elmer, Harold S. | '25 Grant, U. S., IV |
| '36 Elsea, James | '48 Gratz, Norman G. |
| '36 Embury, M. A. | '15 Graves, John O. |
| '14 ESSIG, E. O. (HM, '48) | '48 Green, J. W. |
| '47 Estabrook, L. A. ⁶ | '48 Greenfield, Howard |
| | '32 Gressitt, J. Linsley (LM) |
| | '35 Grimmstein, Edith-Mae |
| | '03 Grinnell, Fordyce |

⁴DOANE—Notice, Proc. in P-P.E. 19 (1) :40. 1943.⁵EHRHORN—Notice, P-P.E. 17 (2) :84. 1941.⁶ESTABROOK—Notice, Proc. in P-P.E.S. 25 (1) :48. 1949.⁷FALL—Obit., P-P.E. 16 (1) :1-3, pl. 1940.⁸FOX—Notice, P-P.E. 4 (4) :192. 1928.⁹FUCHS—Notices, Proc. vol. 1, 53rd meeting, p. 1; 55th meeting, p. 10. 1921. Vol. 2 (4) :62. 1926.

- Ch Grundel, J. G.¹⁰
 '45 Guedet, Rev. Edward
 '29 Gunder, J. D.
 '46 Gustafson, Joel F.
 '37 Hackley, R. E.
 '24 Hadden, F. C. (LM)
 '46 Hagen, Ellsworth
 '39 Hagen, K. S.
 '49 Hall, S. E.
 '47 Hanson, C. H.
 '46 Hardman, N. F.
 Ch Harford, W. G. W.
 Ch Harney, George W.
 '48 Hart, John F.
 '46 Hart, Winfield H.
 '21 Hartman, R. D.
 '35 Harvey, Paul A.
 '46 Harville, John
 '47 Hatch, M. H.
 '36 Haut, Ferne
 '47 Hazel, N. W.
 '48 Hazeltine, William
 '27 Heid, Graham
 '49 Heimpel, A. M.
 '24 Henderson, W. W.
 '48 Henry, Laura M.
 '35 Henry, Louise
 '45 Herman, C. M.
 '10 Herms, W. B.¹¹
 Ch Herr, C. W.
 '30 Hewes, L. I.
 '49 Hildebrand, C. W.
 '16 Hill, C. A.
 '48 Hill, Harry A.
 '13 Hilton, William A.
 '31 Hinton, Howard E.
 '49 Hobbs, Kenneth R.
 '01 Hopping, Ralph¹²
 '50 Hottes, F. C.
 Ch HOWARD, L. O.
 (HonM., '12)
 '34 Hovanitz, William
 '48 Hoyt, C. P.
 '49 Hoyt, William L.
 '50 Hubert, Alexander A.
 '01 Huguenin, J. C.¹³
 '49 Hunt, R. W.
 '03 Hunter, J. S.
 '46 Hurd, Paul D., Jr.
 '49 Innes, K. F.
 '47 James, Maurice T.
 '36 Jensen, Dilworth D.
 '39 Johnson, John W.
 '48 Johnson, Phyllis
 '11 JOHNSTON, O. B.
 (HonM., '11)
 '42 Jones, E.
 '34 Jones, E. W.
 '44 Jones, Paul R.
 '47 Jones, V. E.
 '27 Keen, F. P.
 '20 Keen, Sadie E.
 '51 Keh, Benjamin
 '25 Keifer, H. H.
 '30 Kelley, D. G.
 '40 Ke'ley, Thomas F.
 Ch KELLOG, VERNON
 (HonM., '12)
 '48 Kel'son, Walter E.
 '05 Kerr, Mrs. E. L.
 '36 Kessel, Mrs. E. L. (LM)
 '36 Kessel, E. L. (LM)
 '04 Killeen, John F.¹⁴
 '20 Killeen, Louise Rupe
 '20 Kincaid, Trevor
 '41 King, Lawrence H.
 '05 Knight, F. W.¹⁵
 '48 Knowlton, George F.
 '01 Koebele, Albert¹⁶
 '40 Kolber, Marvin
 '41 Lamiman, J. F.
 '27 Lammertz, Walter E.
 '08 Lange, W. H.
 '33 Lange, W. H., Jr.

¹⁰GRUNDEL—Notice, P-P.E. 10 (1) :26. Obit., 10 (1) :48, pl. 1934.

¹¹HERMS—Notice, P-P.E. 25 (4) :192. 1949.

¹²HOPPING—Obit., P-P.E. 18 (1) :1-3, pl. 1942.

¹³HUGUENIN—Notice, P-P.E. 3 (3) :152. 1927. Obit., Proc. P.C.E.S., 2 (6) :95-96. 1928.

¹⁴KILLEEN—Notice, Proc. in P-P.E. 14 (4) :192. 1938.

¹⁵KNIGHT—Proc. P.C.E.S., vol. 1, p. 36. 1924.

¹⁶KOEBELE—Notice, P-P.E. 1 (4) :191. 1925.

¹⁷LETCHER—Notice, Proc. P.C.E.S. vol. 1, p. 32. 1924.

¹⁸LIGHT—Notice, P-P.E. 23 (3) :144. 1947. Obit. 24 (2) :49-53. 1948.

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| '47 Lanham, U. N. | '36 Michener, Charles D. |
| '21 Larson, A. O. | '46 Middlekauff, W. W. |
| '47 Larson, A. W. | '38 Miller, Robert C. (LM) |
| '20 Lathrop, F. H. | '09 Mitzmain, Maurice B. |
| '51 Lauret, Thomas H. | '42 Moorhead, Peter |
| '16 LEACH, E. R. | '49 Morishita, Frank S. |
| (LM), (HM., '48) | '48 Morris, Eugene |
| '46 Lee, Welton L. | '21 Morrow, A. W. |
| '47 Leech, H. B. | '48 Mote, Don C. |
| '48 Leigh, Francis | '04 Moulton, Dudley |
| '36 Lester, Will, Jr. | '03 Munier, Leon E. |
| Ch Letcher, Beverly ¹⁷ | '47 Murray, W. D. |
| '48 Lewallen, Lawrence L. | '48 Myers, Omar E. |
| '51 Lewis, Norman A. | '23 Nast, E. H. (LM) |
| '37 Light, S. F. ¹⁸ | '20 Newcomer, E. J. |
| '35 Lindahl, John C. | Ch Nunenmacher, F. W. ¹⁹ |
| '49 Linsdale, Donald D. | '47 Nutting, W. H. |
| '27 Linsley, E. Gorton | '48 Osborn, Herbert |
| '21 Lovett, A. L. ²⁰ | '02 Otis, Hamilton |
| '29 McClay, A. T. | '34 Parker, Frank H. |
| '51 McCluskey, Elwood S. | '44 Parsell, Charles, Jr. |
| '20 McCracken, Isabel | '41 Pearce, Wallace M. |
| '13 McGlashan, Ximena | '36 Pedrotti, P. W. |
| '41 McKinsty, A. P. | '37 Pelle, Walter V. |
| '31 McKenzie, Howard L. | '29 Peterson, Charles E. |
| '40 MacLeod, G. F. | '46 Piazza, Salvador R. |
| '51 McMillan, William E. | Ch Pierce, Newton B. |
| '49 MacNeil, C. Don | '21 Pierce, W. D. |
| '40 MacSwain, J. W. | '08 Pilate, G. R. |
| '34 Mabry, Janet | '36 Pisano, Rocci G. |
| (see Boyce) | '19 Plath, O. E. |
| '43 Madsen, Harold | '34 Platt, Fred R. |
| '37 Maehler, Kenneth L. | '39 Poff, Marjorie |
| '48 Malkin, Borys | '41 Potts, R. W. L. |
| '35 Mallis, Arnold | '43 Prince, F. M. |
| '10 Mann, William | '47 Pritchard, A. E. |
| '41 Mansfield, George S. | '48 Proctor, William |
| '50 Marsh, Gordon | '37 Prole, George |
| '47 Marquis, Manuel | '48 Quate, Larry |
| '45 Martin, C. H. | '46 Quinnell, Edwin |
| '19 Martin, J. O. | '38 Rabinovitch, Adolph |
| '48 Matton, Rudolf H. T. | '41 Raski, Dewey |
| '16 Mautz, Wolfgang | '45 Ray, Eugene |
| '31 Mead, Albert R. | '28 Reed, W. D. |
| '20 Melander, A. L. | '47 Rees, B. E. |
| '41 Meyers, Ernest G. | '36 Reeves, William C. |
| '33 Michelbacher, A. E. (LM) | '34 Reitzel, Joseph |

¹⁷LOVETT—Notice, P-P.E. 1(1):48. 1924.²⁰NUNENMACHER—Notice, P-P.E. 22(2):70. 1946. Obit. 24(1):1-5, pl. 1948.

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| '48 Retan, Arthur | '48 Smyth, E. Graywood |
| '46 Reynolds, Harold T. | '50 Snelling, Robert |
| '09 Reynolds, L. R. ²¹ | '37 Snyder, Karl D. |
| Ch Ricksecker, L. E. | '46 Snyder, Karl S. |
| '48 Rindge, Frederick | '50 Spencer, G. J. |
| Ch RIVERS, J. J. | '47 Spitzer, C. H. |
| (HonM., '11) | '25 Spruyt, F. J. |
| '36 Robinson, Wilbert J. | '20 Spuler, Anthony |
| (LM) | '38 Stahler, Nathan |
| '48 Rockwood, L. P. | '49 Stansbury, R. F. |
| '48 Roland, John J. | '45 Steinhaus, E. A. |
| '35 Ross, E. S. (LM) | '27 Steinweden, John B. |
| '49 Ross, Herbert H. | '12 Stephens, Frank |
| '48 Ruckes, Herbert | '48 Stern, Vernon M. |
| '20 Rupe, Louise V. | '10 Sternitzky, R. F. |
| (see Killeen) | '35 Stewart, M. A. |
| '47 Russell, W. A. | '24 Stickney, F. S. |
| '33 Salman, K. A. | '46 Stojanovich, Chester |
| '38 Sampson, W. W. | '48 Stomblor, Victor |
| '24 Sanford, Helen N. | '46 Stone, M. W. |
| '03 Sanford, O. N. | '27 Struble, George R. |
| '14 Sargeant, Winthrop | '21 Tanner, V. M. |
| '31 Saylor, Lawrence W. | '48 Tarshis, I. Barry |
| '49 Schlenger, Evert I. | '47 Thatcher, T. O. |
| '35 Schultz, G. W. | '49 Thomas, Sherman L. |
| '50 Scott, Charles L. | '04 Thompson, J. H. |
| '35 Scott, David B., Jr. | '48 Thurman, D. C. |
| '44 Scullen, H. A. | '48 Thurman, Ernestine B. |
| '47 Seibert, E. E. | '39 Tilden, J. W. (LM) |
| '48 Sher, Samuel A. | '37 Timberlake, P. H. |
| '29 Simmons, Perez | '33 Ting, Peter C. |
| '38 Simonds, William E. | '50 Tinkham, Ernest R. |
| '49 Simons, John N. | '08 Topp, Walter |
| '02 Simpson, H. J. | '49 Tucker, K. W. |
| '49 Sisson, Robert L. | '49 Underhill, R. A. |
| '46 Skinner, Frank | '35 Upholt, William (LM) |
| '34 Sloop, Kenneth D. | '27 Usinger, Robert L. |
| '35 Smith, Arthur | '47 Van den Bosch, R. |
| '48 Smith, Claude I. ² | '14 VAN DUZEE, E. P. |
| '35 Smith, Edgar | (HonM., '38) ²³ |
| '39 Smith, Ernestine I. | Ch VAN DYKE, EDWIN C. |
| '42 Smith, G. F. | (HM., '38) |
| '48 Smith, Gordon L. | '24 Van Dyke, Mrs. Edwin C. |
| '24 Smith, Harry | '37 Vargas, Glenn |
| '25 Smith, Ralph H. | '20 Vickery, R. K. |
| '41 Smith, Ray F. | '37 Vogel, Marcel J. |

²¹REYNOLDS—Notices, Proc. P.C.E.S. 2(2):20, 29. 1924.

²²SMITH—Obit., P-P.E. 26(2):59-60. 1950.

²³VAN DUZEE—Notice, P-P.E. 16(3):123. 1940. Obit., 16(4):145-177, pl. 1940.

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|-----------------------------|-------------------------------------|
| '33 Walker, B. C. | Ch Whiting, C. A. |
| '42 Walker, John R. | '38 Whitney, Ruth C. |
| '19 Wallace, Grant | '30 Wilbur, Paul C. |
| '25 Walther, Eric | '04 Williams, Francis X. |
| '35 von Bloeker, J. C., Jr. | '25 Wilson, George R. ²⁴ |
| '50 Wade, W. H. | '48 Wilson, Kent H. |
| '41 Walz, Arthur J. | '29 Wind, Robert G. |
| '48 Waters, Norman D. | '03 Winslow, Ross E. |
| '48 Watkins, Stanley | '47 Wirth, W. W. |
| '48 Watson, John M. | '01 WOODWORTH, C. W. |
| '48 Wegenek, E. G. | (HonM., '12) ²⁵ |
| '10 Wellman, Creighton | '03 Wright, Julia |
| '46 Welsh, Hartwell H. | '27 Wright, Percy F. |
| '46 Weitz, Loyal A. | '27 Wymore, F. H. |
| '38 Wheeler, Willis | '44 Zanette, D. A. |
| '36 White, B. E. | '30 Zimmerman, E. C. (LM) |
| '48 White, Raymond G. | |

²⁴WILSON—Obit., P-P.E. 14 (3) :143-144. 1938.²⁵WOODWORTH—Obit., P-P.E. 17 (1) :30. 1941.

ZOOLOGICAL NOMENCLATURE: NOTICE OF PROPOSED SUSPENSION OF THE RULES IN CERTAIN CASES FOR THE AVOIDANCE OF CONFUSION AND THE VALIDA- TION OF CURRENT NOMENCLATORIAL PRACTICE

Notice has been received from Secretary Francis Hemming of the International Commission on Zoological Nomenclature that cases involving the following names of insects are now being considered by the Commission. Details of these cases are given in parts 1-4 of volume 2 of the *Bulletin of Zoological Nomenclature* (April 20, 1951) and part 5 of the same volume (May 4, 1951). Interested specialists are urged to send any comments that they wish to make on these cases to the Secretary, 28 Park Village East, Regent's Park, London, N. W. 1, England, as soon as possible and, in any case, not later than the close of the six month period set aside for public discussion of such cases.

If received in sufficient time, comments received in response to the present Notice will be published in the *Bulletin of Zoological Nomenclature*; applications received too late to be so published will be brought to the attention of the International Commission at the time of the commencement of voting on the application in question.

APPLICATIONS IN PART 1

- (1) *Aphidius* Nees, 1818 (Class Insecta, Order Hymenoptera) (pp. 18-20) (File 149);
- (2) Trivial name *ajax* Linnaeus, 1758 (as published in the combination *Papilio ajax*) (Class Insecta, Order Lepidoptera) (pp. 26-30) (File 192);

APPLICATIONS IN PART 2

- (3) *Rantus* Dejean, 1833 (Class Insecta, Order Coleoptera) (pp. 40-45) (File 171);
- (4) *Acantholyda* Costa, 1894 (Class Insecta, Order Hymenoptera) and *Acanthocnema* Becker, 1894 (Class Insecta, Order Diptera) (p. 46) (File 175);
- (5) *Rhina* Latreille, [1802-1803], and *Magdalis* Germar, 1817 (Class Insecta, Order Coleoptera) (pp. 47-55) (File 202);

APPLICATIONS IN PART 4

- (6) *Capsus* Fabricius, 1803 (Class Insecta, Order Hemiptera) (pp. 103-104) (File 211);
- (7) *Tettigonia* and *Acrida*: proposed validation as from Linnaeus, 1758 (application submitted under *Opinion* 124) (pp. 106-118) (File 328).

APPLICATIONS IN PART 5

- (8) *Titania* Meigen, 1800, and *Chlorops* Meigen, 1803 (Class Insecta, Order Diptera) and associated family names (pp. 134-138) (File 197).
- (9) *Dorilas* Meigen, 1800, and *Pipunculus* Latreille, [1802-1803] (Class Insecta, Order Diptera) and associated family names (p. 140) (File 221).
- (10) *Tendipes* Meigen, 1800, and *Chironomus* Meigen, 1803 (Class Insecta, Order Diptera) and associated family names (pp. 150-151) (File 469);
- (11) *Philia* Meigen, 1800, and *Dilophus* Meigen, 1803 (Class Insecta, Order Diptera) (pp. 153-154) (File 498).
- (12) *Tylos* Meigen, 1800, and *Micropeza* Meigen, 1803 (Class Insecta, Order Diptera) and associated family names (pp. 156-159) (File 501).

In addition to applications involving the possible use of the plenary powers, the Parts of the Bulletin contain the following cases relating to the names of insects:

Part 1 (pp. 21-25): question of the availability of the name *Leptopsylla* Rothschild & Jordan, 1911 for the House Mouse Flea (Order Siphonaptera) (File Z.N. (S) 166).

Part 2 (pp. 56-58): Proposed addition of certain names of genera in the Order Collembola to the *Official List of Generic Names in Zoology* (File Z.N. (S) 207).

NEW WESTERN EPHEMEROPTERA II¹

VELMA KNOX MAYO

*Nickel Plate, British Columbia**Ephemerella pelosa* Mayo, new species

(figures 6, 7)

Nymph (figs. 6, 7). Dark brown species with yellow markings. No tubercles, but long hairs on head, thorax and abdomen. *Head* yellow with brown vertex and brown stripe along midline the entire length of face. Antennae yellow at base, tinged with light brown distally. Line of hairs on anterior surface of basal segment of antennae. Long, dense fringe of hairs on genae from eyes to mouth-parts. No frontal shelf. Hairs also on occiput. Maxillary palp present. *Prothorax* dark brown along posterior margin and medially, antero-lateral angles and two thirds of lateral margin yellow. Long white hairs on either side of midline. Mesonotum dark brown with yellow markings (see fig. 6). Long, fine white hairs on either side of midline on entire thorax. Unsclerotised areas on pleuron and ventral surface smoky. Sclerites yellowish brown. *Legs* yellow with two wide brown stripes on upper surfaces of femora, and along anterior border of tibiae and tarsi. Posterior surfaces of femora washed with brown in basal two thirds. Small spines along posterior borders of fore tibiae and all tarsi. Claws with three small spines. Legs with heavy fringe of hairs on upper surfaces of all segments; note arrangement of hairs on upper surface of all femora (fig. 6). Abdominal tergites very dark brown, tergite 8 yellowish along lateral posterior margins. Instead of bearing tubercles, tergites have paired tufts of hair on posterior margins. They resemble little whisk brooms with about twenty coarse hairs in a tuft. The hairs are longer than the distance between tufts. Tufts are further apart on segments 1-2 (those on 1 covered by wing pads); about equidistant on segments 3-6, closer together on 7-8 and on 9 they are close to midline. Long hairs along entire midline on 10th segment. Traces of light spots above tufts on segments 5-7; laterally on segments 8-9. Lateral posterior border of segment 10 yellow. Tails yellow with one distinct brown band on each, near base; brown spines in whorls at joinings of segments. Tails with long fringe of hairs on anterior surface. Gills present on abdominal segments 3-7. No spines on posterior-lateral angles on tergites. Abdominal sternites yellowish-brown basally, dark brown towards the tail. As in *E. doddsi* Needham, there is an adhesive disc formed of hairs on the ventral surface. The entire sternites 3-8 are covered with long, white hairs (fig. 7). These radiate from a point at the midline on the posterior border of segments 3-7, and those on segment 8 all grow from the anterior border. Length: body 8 mm., tails 8 mm.

¹Number I of this series appeared in the October, 1939, issue of the Pan-Pacific Ent. 15 (4):145-154.

Holotype, nymph (in alcohol), NORTH FORK CREEK above BASS LAKE, FRESNO COUNTY, CALIFORNIA, June 15, 1934. Altitude 3,300 ft. Collected by P. R. Needham and party. Type in the California Academy of Sciences.

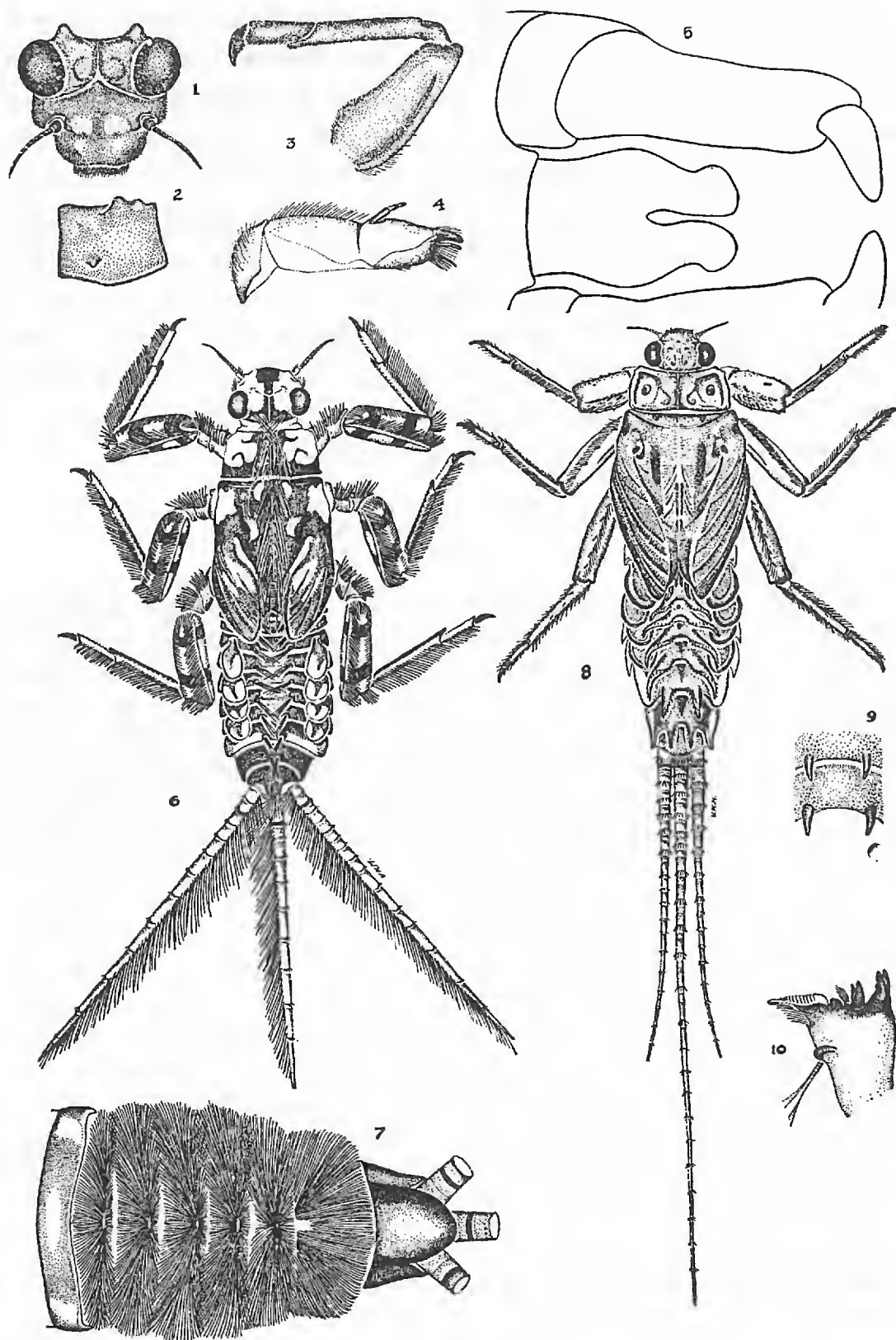
Ephemerella pelosa n. sp. appears to be unique in having hairs and tufts in place of tubercles. It resembles *E. doddsi* in but one characteristic, that of the adhesive disc.

Ephemerella spinosa Mayo, new species

(figure 8)

Nymph (fig. 8). Color dark brown, lighter in immature specimens. Pattern on head and thorax as in figure. No tubercles on head or thorax. Legs yellowish brown. Fore femora with six or eight coarse spicules on posterior margin and upper surface. Middle and hind femora with coarse spicules and fringe of hairs along posterior margin. All tibiae with several spicules medially and at tarsal joinings. Fringe of hairs on fore tibiae and double fringe on middle and hind tibiae. All tarsi with regular row of spines along anterior margin. Claws with 8 or 10 denticles. All joinings dark brown; distal portion of tarsi and claws dark brown. Abdomen conspicuous with prominent spines on tergites 2-9. Those on 2 very close together and straight. Those on 3 farther apart and directed slightly outward. On segments 4-7 they are widely divergent and increase in size to rearward. They are directed both laterally and posteriorly, the tips curved as in fig. 8. Each spine bears a row of coarse spicules from the base on posterior margin, obliquely curving out to the anterior surface of the tip (fig. 8). On segments 8-9 the spines are stout but much shorter and straight, directed but slightly outward, those on 9 shorter than those on 8. The tergites are light brown with dark patches extending from the anterior margins, forming triangles along the midline and dark areas under each gill. All abdominal sternites marked with prominent dark lateral triangles which are connected medially along anterior border. Ganglionic area brown on sternites 1, 6, 7; most prominent on 7. Tails yellowish-brown, each ringed near the base with a dark brown band. Posteriorly each segment of tails with whorl of prominent brown spicules. Outer tails not quite $\frac{2}{3}$ length middle tail. Length of body: 7 mm.; of middle tail, 11 mm.

Holotype, nymph (in alcohol), SOUTH FORK BISHOP CREEK, INYO COUNTY, CALIFORNIA, altitude 9,500 ft., July 4, 1938. Collected by the writer. Paratypes, two specimens, one same locality, June 25, 1934; collected by P. R. Needham and party; one Big Pine Creek, altitude 8,100 ft., Inyo County, California, July 2, 1939; collected by the writer. Holotype in the California Academy of Sciences, paratypes in the collection of the writer.



Figs. 1-5, *Ephemerella* species number 1: fig. 1, head of nymph; fig. 2, lateral view pronotum of nymph; fig. 3, foreleg of nymph; fig. 4, maxilla of nymph; fig. 5, male genitalia of subimago. Fig. 6, nymph of *Ephemerella pelosa*. Fig. 7, ventral view of abdomen showing adhesive disc of nymph of *Ephemerella pelosa*. Fig. 8, nymph of *Ephemerella spinosa*. Fig. 9, abdominal tergites 7-8 of nymph of *Ephemerella* species number 1. Fig. 10, mandible of nymph of *Ephemerella* species number 1.

E. spinosa n. sp. is a member of the Needhami Group, and is closely related to *E. hystrix* Traver, from Montana. Dr. Needham kindly compared *spinosa* with the type of *E. hystrix* Traver and states that "*spinosa* is relatively broader in form of body, and there appears to be a distinct difference in the form of the dorsal spines of the abdomen. In *E. hystrix* Traver they are straight and nearly smooth." In *spinosa* they are distinctly curved and bear prominent spicules their entire length. Gills darkened in *spinosa*, pale in *hystrix* Traver. In McDunnough's description of *hystrix* Traver (Can. Ent., 67:98) he states that the outer tails are only "slightly shorter than median one, being about $4/5$ its length." In *spinosa* the outer tails are less than $2/3$ length of median.

EPHEMERELLA SPECIES NUMBER 1
(figures 1-5, 9, 10)

Male subimago (fig. 5). Abdomen reddish, thorax pale. Anterior margin of pronotum with a V-shaped notch at midline, and posterior margin curved to fit mesoscutum; pale medially, dark brown laterally with a mottled pattern. Mesoscutum creamy with dark brown along lateral sutures and at wing bases. Prescutum dark brown. Pleural sclerites dark brown; unsclerotised areas creamy. Wing veins brown. All femora yellow basally, dark red in apical half. Fore tibiae narrowly yellow along anterior surface, dark red elsewhere. Middle and hind tibiae yellow; all tarsi yellow. Black streak at joinings of tibiae and tarsi, and narrowly black at tarsal joinings. Claws dissimilar. Abdominal tergites with a wide red area along midline which is paler medially, dark red laterally, banded by yellow on either side. Lateral to the yellow bands are red patches; pleural fold is yellow. The abdominal sternites are more uniformly red, with the lateral margins yellow. At the anterior margin of sternites 1-8 are pale oblique streaks, one on either side of midline. Posterior margin of sternite 9 dark reddish brown. Forceps yellowish, penes pale, lyre-shaped. Tails dark red basally, yellow distally, covered with very fine dark hairs. Length: body 11 mm., wing about 14 mm.

Nymph (figs. 1-4, 9, 10). Very dark uniform brown. Tubercles present, but short and blunt. The pronotum with a pair of blunt twin tubercles, the posterior of these much shorter. About midway between these is a wart-like tubercle on either side of midline. Anterior to this group and near lateral margin of pronotum is a sharper tubercle, one on either side. Prosternum with tubercle directed towards head. Ridge along anterior margin of mesonotum but no real tubercles except a slight elevation on scutellum. The mesonotum is roughened and covered with minute dark brown spicules. No teeth on fore femora (fig. 3). Femora brown, tibiae and tarsi yellowish-brown, marked in basal portion of each segment with blackish. Claws dark red with six denticles. Abdominal tergites with

paired spines on segments 2-9. These are wider apart than the length of the spines; on segments 2 and 9 they are slightly closer together than on other segments. All spines practically equal in size, those on 8-9 being but slightly stouter. The spines and tergites sprinkled with minute, dark spicules such as are present on thorax. All tergites evenly colored reddish brown. Gills present on segments 3-7. Tails reddish brown basally, alternating with yellow in outer two thirds. Ventrally the markings of the subimago show through abdominal sternites as two oblique streaks from anterior margin. Laterally is a faint streak on each sternite. Lateral abdominal angles well developed. Length: body, 10 mm.

Male subimago (in alcohol), Cottonwood Creek near Oasis Ranch, California, Mono County line close to California-Nevada boundary, altitude 5,100 ft., June 11, 1939; collected by the writer. Specimens in the collection of the California Academy of Sciences and in that of the writer.

Nymphal material same data; twenty-three specimens.

Ephemerella species number 1 is very closely allied to *E. grandis* Eaton. In the subimago of *E. grandis* Eaton the fore legs are longer than those of *E. species number 1*. The forceps are similar, but the penes are of different shape (see fig. 5). Those of *E. grandis* Eaton more slender, narrower midway between base and tips. In *E. species number 1* there is a widening on either side, midway between base and tips, suggesting the shape of a lyre.

In the nymphs the prothoracic tubercles of *E. grandis* are slightly larger than those of *E. species number 1*. The wart-like tubercles close to the twin tubercles in *grandis* are laterad; in *E. species number 1* they are median. The maculation of the abdominal segments is not similar in the two species.

REFERENCES

MCDUNNOUGH, J.

1935. Canadian Entomologist, 67 (5) :98.

NEEDHAM, TRAVER, HSU

1935. Biology of Mayflies, Comstock Publishing Co., Ithaca, New York.

BOOK NOTICE

Larvae of the Elaterid Beetles of the Tribe Lepturoidini (Coleoptera: Elateridae), by Robert Glen, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada, 8vo., paper, 246 pp. Smithsonian Miscellaneous Collections, vol. III, no. II, Smithsonian Publication 3987, April 19, 1950.

This publication was received and read with great interest by the reviewer, who has spent over 30 years studying the economic group of elaterid beetles, the larvae of which are commonly known as wireworms. During the early years of his work with this group the lack of adequate morphological knowledge of both the larval and adult stages of these agricultural pests was a serious handicap in differentiating related species. The reviewer has spent many years trying to straighten out the adult taxonomy. Since many of our wireworms of economic importance take several years to complete their life cycle, it is essential that species be known in the larval stage, without a long process of rearing. This volume by Dr. Glen is not only a fine contribution to the science of taxonomic entomology, but it is also a valuable aid to the economic field.

Dr. Glen has recently been appointed Chief of the Division of Entomology, Science Service, Ottawa, but he initiated this work on the morphology of the larval stage of wireworms in 1929, under the direction of Dr. K. M. King, who was then in charge of the Dominion Entomological Laboratory at Saskatoon, Saskatchewan.

Dr. Glen's earlier works on the detailed larval description of individual species have been very helpful to others studying wireworms, but in this larger work he now brings together all the information found in the literature of the world on the larvae of the tribe Lepturoidini, including many of economic importance. Altogether he treats of 93 species, included in the following 11 genera: *Athous* (14); *Crepidomenus* (1); *Cryptohypnus* (5); *Eanus* (2); *E'athous* (1); *Hemicrepidius* (5); *Hypnoidus* (3); *Lepturoides* (3); *Limonius* (14); *Ludius* (44), and *Melanactes* (1).

Since his investigations were discontinued in 1942, some of the recent changes in nomenclature of the Elateridae have not been included. The tribe Lepturoidini should now be called the Denticolini, and the genera would be changed as follows: *Cryptohypnus* to *Hypolithus*; *Hypnoidus* to *Negastrius*; *Lepturoides* to *Denticollis*, and *Ludius* to *Ctenicera*.

There is a fine summary of literature on the subject from 1855, including such names as Schiodte (1870); Comstock and Slingerland (1891); Forbes (1892); Hendriksen (1911); Hyslop (1917); Hyslop and Boving (1935), and Lanchester (1939). He follows the terminology of Hyslop, Boving, Snodgrass and Anderson, as well as others.

The prairie grain wireworm (*Ctenicera destructor* Brown) has been used as a typical larva of the group and described in detail. On page 33 there is a key to the larvae of the subfamilies of the Elateridae and to the tribes of the subfamily Pyrophorinae. This is

followed by keys to genera, isolated "species groups" and isolated species of the tribe Denticollini (Lepturoidini). The various "isolated" groups and species of each genus are taken next, with keys, descriptions, distribution, and source of material given under each. There is a summary of taxonomic relationships with list of species studied as an index on pages 197, 198. Literature cited runs to 8 pages, which is a most complete bibliography of the principal literature on elaterid larval morphology, as well as some on biology and adult taxonomy. There are 40 pages of drawings, all by the author.

The section on the genus *Limonius* is somewhat confused, but this can be charged mainly to lack of material and published information regarding adults. The reviewer has revised the adult taxonomy, at least of the economic forms, although it is still unpublished.

Lanchester in 1946 published the identifying characters separating six of the economic species, four western and two eastern. The larvae of *Limonius anceps* LeConte and *L. ectypus* Say are still unknown. The species in Dr. Glen's key, page 164, called *L. subauratus* LeConte is really *L. infuscatus* Motschulsky and the species near *L. ectypus* Say from Manitoba, Saskatchewan, and Alberta is probably *L. californicus* Mannerheim, as this species is known from various places in Montana by adults and larvae.

Only one who has worked a long time with wireworms, both systematically and biologically, can appreciate the vast amount of effort that went into the preparation of Dr. Glen's work. We hope it will form a basis for future works in this and related groups, and that it will inspire other workers to add to our knowledge of wireworms over the world. One of the great needs is more students of larval taxonomy with the ability and patience, shown by Dr. Glen, to help the economic entomologist determine the species with which he works.—MERTON C. LANE, Walla Walla, Washington.

HETERLIMNIUS KOEBELEI IN OREGON

(Coleoptera: Elmidae)

Collecting in the Little Applegate River area, Jackson Co., Oregon, 10 miles from California, on August 5-6, 1950, Mr. Vernon E. Thatcher of Oregon State College and I took 18 specimens of *Heterlimnius koebelei* Martin, over 80 specimens of *H. quadrimaculatus* Horn, and numerous larvae of both species. *H. koebelei* was known previously from Washington and the new record represents a southward extension of the range. The beetles were in a tiny, rapidly flowing mountain stream at 2300 feet altitude and were clinging under stones and in crevices. I am indebted to Dr. M. W. Sanderson for the identifications.—BORYS MALKIN.

FOUR NEW FLEAS OF THE GENUS
DACTYLOPSYLLA JORDAN, 1929

(Siphonaptera)

FRANK M. PRINCE AND HAROLD E. STARK¹*Communicable Disease Center, Public Health Service,
Federal Security Agency, Atlanta, Ga.*

Among fleas sent in by field units of the Western Communicable Disease Center Laboratory, two new species and one new subspecies of *Dactylopsylla* Jordan 1929 were noted and are herein described. A third species being described is from collections obtained by the junior author while gathering material for a master's thesis on Utah fleas.

Dactylopsylla bluei psilos Prince and Stark, new subspecies

This subspecies (figs. 1-5) is closely related to *D. bluei bluei* (C. Fox, 1909), but as the name indicates it is armed with fewer bristles.

Head: Clypeal tubercle absent as in *D. b. bluei*. Antenna reaches beyond posterior border of head in male but does not in female. Scape in both sexes without setae. Pedicel of male without setae; pedicel of female with 8 setae reaching beyond end of clava. Clava of male definitely segmented but segmentation of clava of female not pronounced. Double row of small setae above antenna of male; single row in female. Two rows of medium and large setae on gena and one row on posterior border of head. Mouth parts short, labial palps extend only two-thirds length of fore coxa.

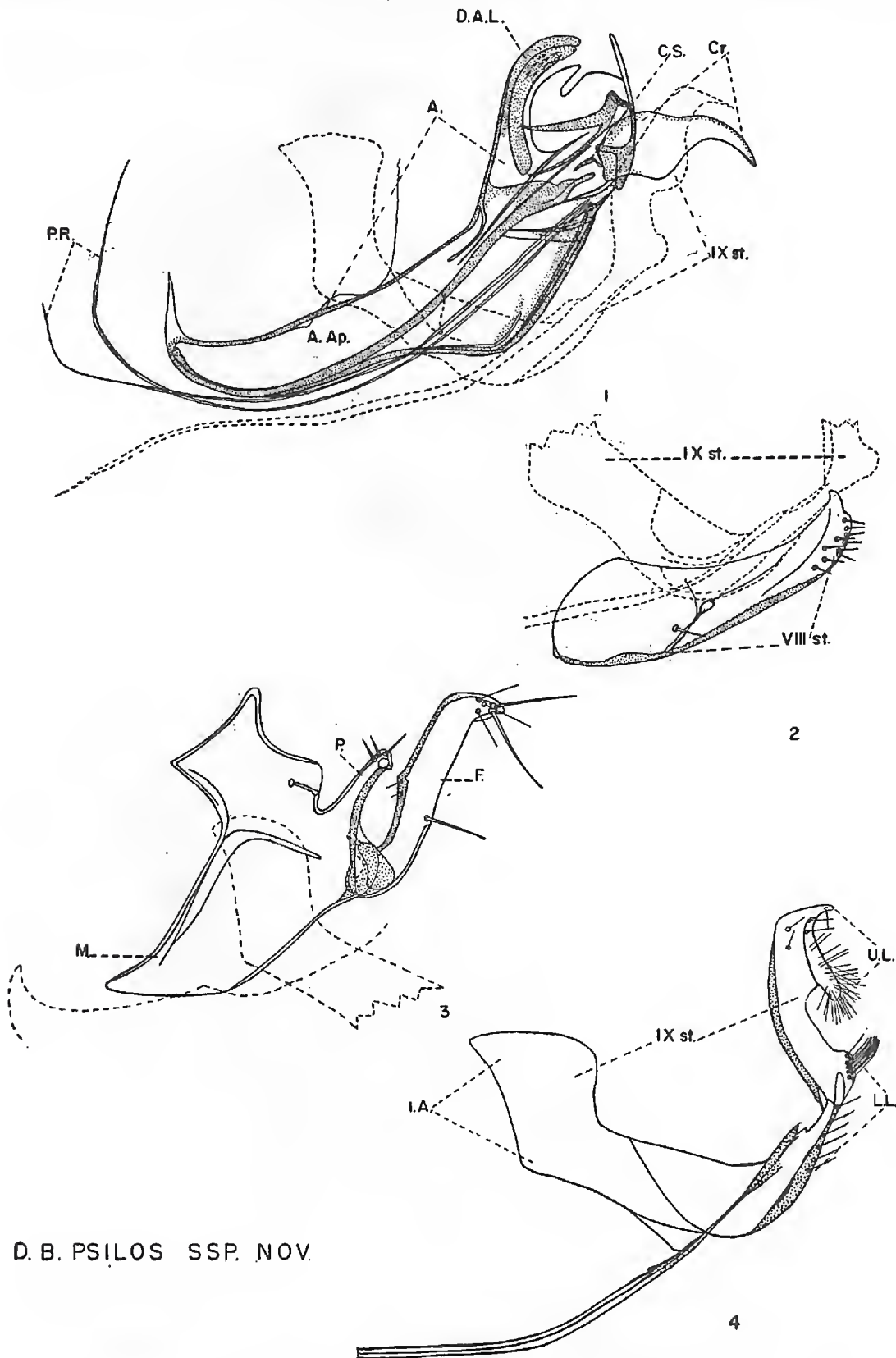
Thorax: Pronotal ctenidium with 19 or 20 teeth. Meso- and metathorax not heavily covered with setae. Posterior dorsal row of setae on mesonotum (both sexes) consists of from 5 to 7 setae on each side, while other species of *Dactylopsylla* have 8 to 12 setae. Posterior dorsal row of setae on metanotum consists of from 7 to 9 setae on each side while all other species except *D. b. bluei* and *D. digitenua* have more. This row on *D. b. bluei* specimens numbers from 8 to 10 setae. The number of long, stout, dorsal bristles on the hind tibia ranges from 17 to 22. The medial displacement of the first pair of plantar bristles of segment V of tarsae is not pronounced.

Abdomen: Over-all chaetotaxy on abdomen is similar to other species of *Dactylopsylla* except for being sparse. The average number of setae in each posterior row on abdominal tergites is 12 on

¹From Western Communicable Disease Center Laboratory, San Francisco, Calif.

each side; in other species 14; though in *D. b. bluei* up to 16 on each side. Antepygidial bristles: one with one small seta in male; three in female.

Modified segments. Male: The VIII tergum is large, covering most of the external genitalia. The VIII sternum is reduced and



D. B. PSILOS SSP. NOV.

(All figures are in lateral view, left side)

Figs. 1-4, *Dactylopsylla bluei psilos*. 1, aedeagus; 2, VIII sternum; 3, manubrium, clasper, finger; 4, IX sternum.

unmodified, having no posterior process and no diagnostic setae except 10 or so extremely small setae. The IX tergum reduced as a whole, manubrium being shorter than in *D. b. bluei*. Clasper is

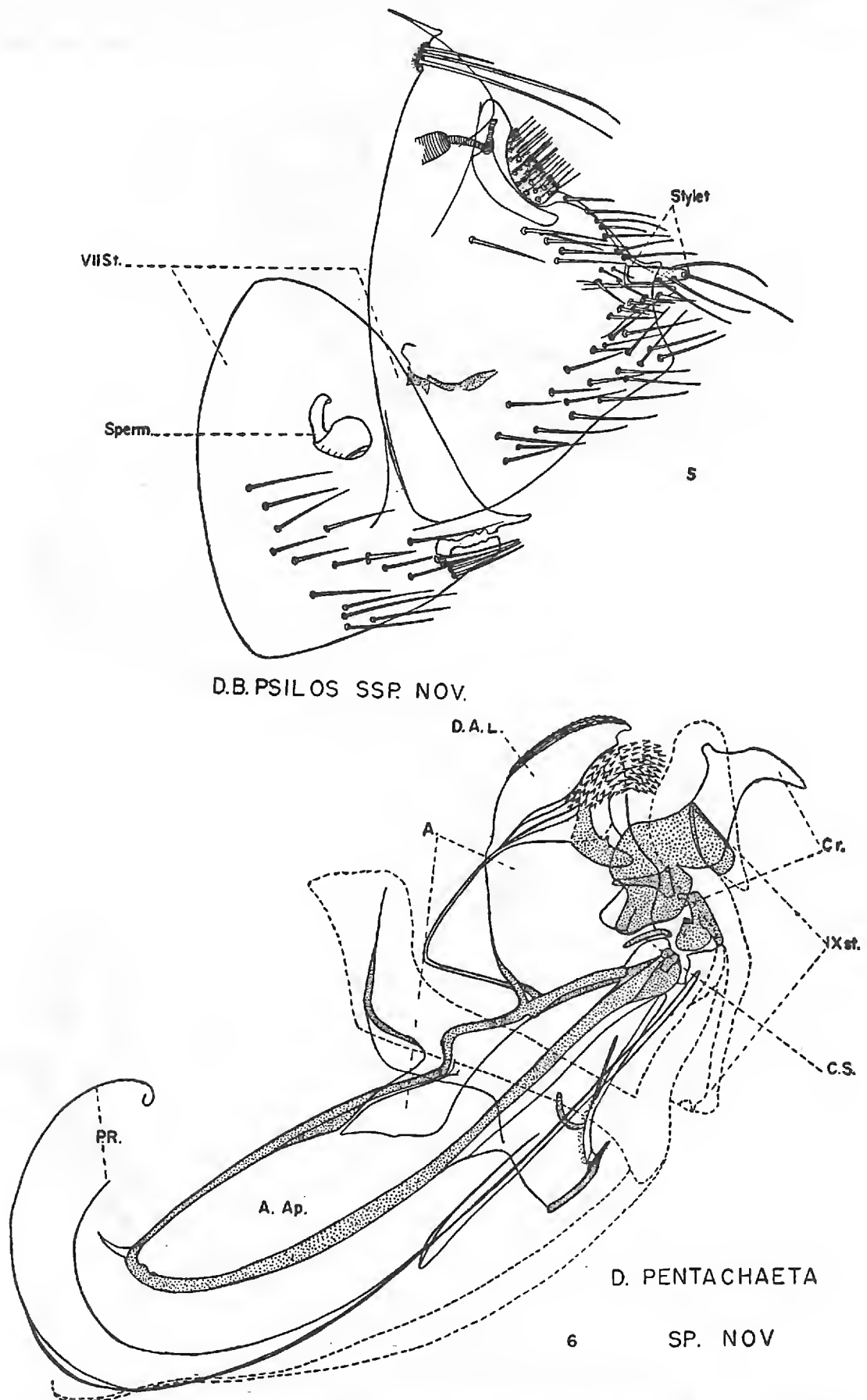


Fig. 5, *Dactylopsylla b. psilos*, posterior segments of female. Fig. 6, *D. pentachaeta*, aedeagus.

small, with a prominent, narrow, dorsal process. Finger long and narrow as in *D. b. bluei* but the distal end is not turned as far posteriorly. The internal arms of the IX sternum are large as in *D. b. bluei*. The median lobe bears many small, fine setae. The upper lobe is relatively larger than in *D. b. bluei* and is heavily covered with thin setae. The dorsal process of the upper lobe is broader and the ventral process is smaller than in *D. b. bluei*. The aedeagus is similar in shape to *D. b. bluei*, but the distal ends of the crochets are small and directed posteriorly.

Female: The posterior border of the VII sternum shows a small, prominent, sharply pointed lower lobe which marks the junction of the ventral border and the posterior border. The only available female (allotype) has a broken section in the lobe giving the appearance of two lobes as shown in the drawing. This female has a collapsed spermatheca. The tail is well differentiated from the head and bears a very prominent appendage. The head is probably an oval subglobular shape. The stylet terminates in a medium-sized bristle (seta) and has two ventral setae.

Measurements (lengths): Holotype male, 2.8 mm. Allotype female, 3.9 mm. Paratype males, 3.3 mm.; 3.3 mm.; 3.2 mm.; 3.1 mm.; 2.9 mm.; 2.8 mm.; 2.8 mm. Average, 3.1 mm. for males.

Type host: *Thomomys perpallidus* subsp.

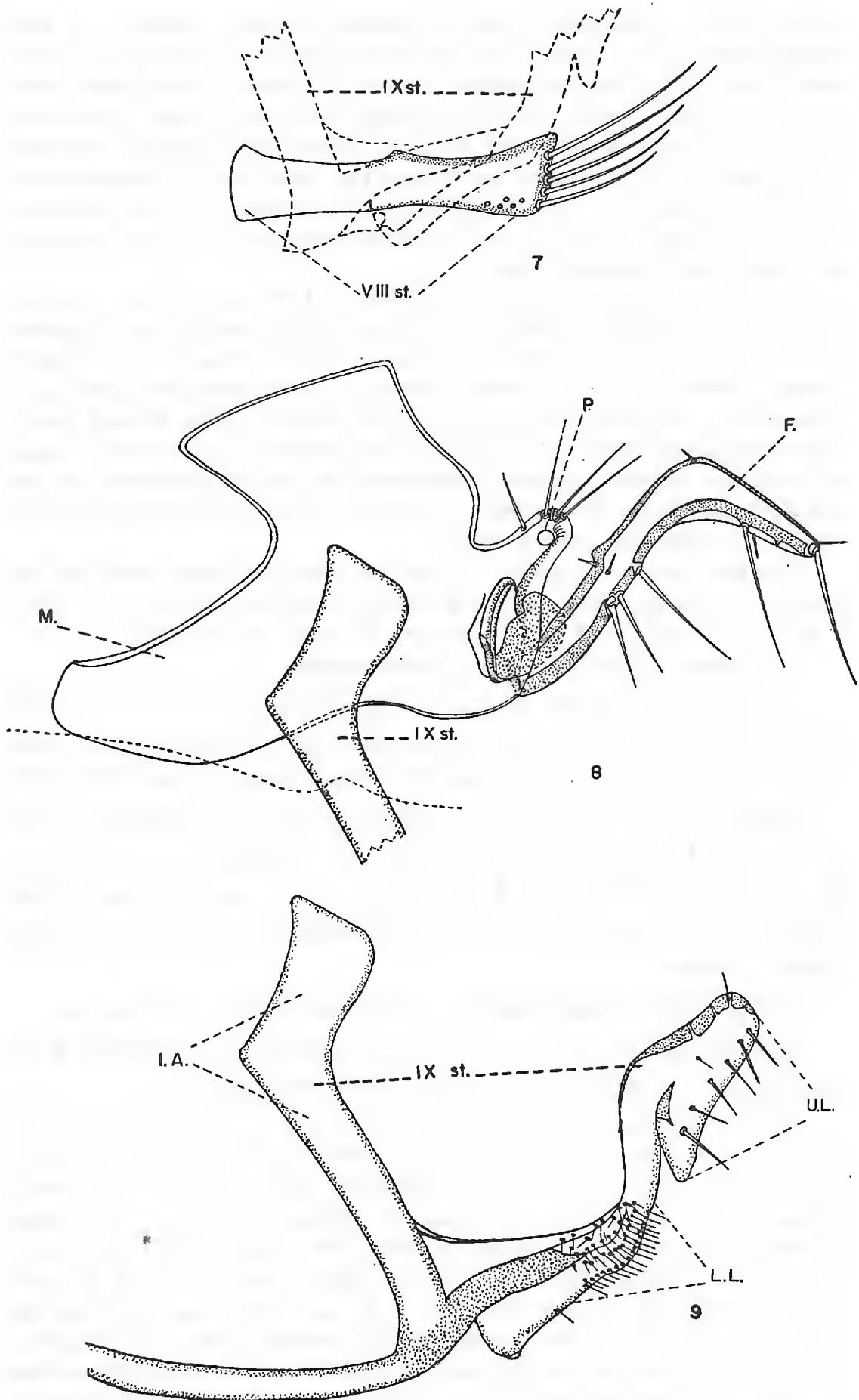
Type locality: 20 mi. W. LAS VEGAS, STATE GAME REFUGE, 2300 ft., CLARK CO., NEVADA. Ecological association: greasewood, cacti. Collected by Mr. Huey Owen and Mr. Orris Smith, March 26, 1949.

Holotype male and allotype female on deposit at Western Communicable Disease Center Laboratory. Paratype males: one at U. S. National Museum, Washington, D. C., and one at British Museum (Natural History), in Siphonaptera collection at Tring, Herts, England.

Dactylopsylla pentachaeta Prince and Stark, new species

This species (figs. 6-10) is closely related to *D. percernis* Eads and Menzies, 1949 and *D. neomexicana* Prince, 1945.

Head: Clypeal tubercle absent. A notch is present but barely discernible in both sexes. Antennae extend to posterior border of head in the male but not in the female. Scape with 5 very small setae. Three extremely tiny setae on pedicel of male; 7 or 8 setae on pedicel of female reaching to end of the clava. The clava has 9 distinct segments. These characters differ from those of *D. percernis* in that the pedicel of the male *D. percernis* has 6 distinct but thin setae reaching half the length of the clava, and the female of both *D. percernis* and *D. neomexicana* has 7 or 8 setae on the pedicel reaching beyond the clava. The male of *D. neomexicana* has 7 or 8 extremely tiny setae similar to *D. pentachaeta*. Vertex of cranium (male only) and borders of gena heavily chitinized. Two distinct rows of large-sized bristles on gena (5 or 6 bristles in each row)



D. PENTACHAETA SP. NOV.

Figs. 7-9, *Dactylopsylla pentachaeta*. 7, VIII sternum; 8, manubrium, clasper and finger; 9, IX sternum.

and one row on posterior border of head. Small setae above antennae begin as two rows anteriorly and grade into four irregular rows posteriorly. Mouth parts short; labial palps extend only two-thirds length of fore coxa.

Thorax: Pronotal ctenidium with 21 teeth in both sexes. Meso- and metathorax as in other members of genus. Hind tibia has 22 long, stout, dorsal bristles. First pair of plantar bristles of segment V of tarsae are turned downward and inward.

Abdomen: Over-all chaetotaxy as in other members of genus. Antepygidial bristles 3 in male, 4 in female.

Modified segments. Male: The VIII tergum is large and covers most of the external genitalia. The VIII sternum is very distinct. It has virtually no posterior process but terminates broadly with 5 large, distinct setae. The VIII sternum of *D. neomexicana* bears 3 or 4 large, distinct setae and has a small posterior process which is slightly more pronounced than in *D. pentachaeta*. *D. percernis* has 4 smaller bristles, and the outline of the VIII sternum is quite unlike that of *D. pentachaeta*. The IX tergum is distinct and well inside the body cavity. The clasper is small, with narrow prominent dorsal process. The finger is large. The distal one-third of the finger is extended posteriorly from a 90° angle. The anterior border of the finger has a small but prominent protrusion in the middle. This process is not present in either *D. neomexicana* or *D. percernis*. There are 3 medium-sized bristles along the posterior border, 2 placed close together. This is similar to *D. neomexicana*, but *D. percernis* has only 2 medium-sized bristles along the posterior border. The internal arms of the IX sternum are prominent. Externally the median lobe bears many small setae on the posterior and lateral parts. The upper lobe is quite prominent, bearing many thin setae.

Female: Posterior border VII sternum with distinct sinus. This sinus is not prominent in either *D. percernis* or *D. neomexicana*. Spermatheca without demarcation between head and tail. Process at tip of tail. Head not as heavily pigmented as *D. percernis* or *D. neomexicana*. Stylet terminates with medium-sized bristle and has two ventral bristles, one small lateral bristle and two exceedingly tiny dorsal bristles. *D. percernis* and *D. neomexicana* have the two ventral bristles but no small lateral bristle.

Measurements (lengths): Holotype male, 3.2 mm. Allotype female, 3.6 mm. Paratype females, 3.6 mm. and 3.2 mm.

Type host: *Mustela* sp.

Type locality: LOUICH RANCH, 20 mi N., 5 mi. E. BENKELMAN, 3,200 ft., DUNDY CO., NEBRASKA. Ecological association: rolling sand hills, grass, *Cynomys* sp. present. Collected by Mr. Huey Owen and Mr. Dwight Campau, June 12, 1945.

Holotype male and allotype female on deposit at Western Communicable Disease Center Laboratory. One paratype female at U. S. National Museum, one at British Museum (Natural History).

Dactylopsylla digitenua Prince and Stark, new species

This species (figs. 16-19) is close related to *D. pentachaeta* but is separated readily on the modified segments, particularly the finger of the clasper and the crochet. Only one male is known to us.

Head: Clypeal tubercle as in *D. pentachaeta*; a notch discernible. Antennae extend slightly beyond posterior border of head. Scape with 5 very small setae. Six extremely thin setae on pedicel reach only to the first segment of the clava which has 9 distinct segments. The small setae above antennae grade into three irregular rows instead of four. Chaetotaxy of head otherwise as in *D. pentachaeta*.

Thorax has fewer setae than *D. pentachaeta*. The anterior dorsal rows of setae on the meso- and metanotum number about 10, and the posterior dorsal rows number 8 in *D. digitenua*, while in *D. pentachaeta* the anterior dorsal rows number 15 and the posterior dorsal rows number 11 setae on each side. The hind tibia has 18 long, stout, dorsal bristles. Plantar bristles of segment V as in *D. pentachaeta*. Pregenital segments of abdomen as in *D. pentachaeta*.

Modified segments. Male: The VIII sternum has no posterior process, differing from *D. pentachaeta* which has a very inconspicuous process dorsal to the five bristles. There are 5 setae on the left side of the VIII sternum as in *D. pentachaeta*, and 4 setae on the right side as in *D. percernis*. The dorsal process of the clasper is similar to that of *D. pentachaeta*. The finger of the clasper is much more slender than in *D. pentachaeta*. The placement of the bristles on the finger is identical. The lower lobe of the IX sternum is a little more broadly curved, and the upper lobe is very thin and elongated while that of *D. pentachaeta* is quite broad and bears many thin setae. In this respect it resembles *D. percernis* and *D. neomexicana*. The crochet is quite different from that of *D. pentachaeta* and *D. percernis*. Instead of being more or less rounded and produced posteriorly, it has one dorsal and one posterior, prominent, narrow process, as in *D. neomexicana*.

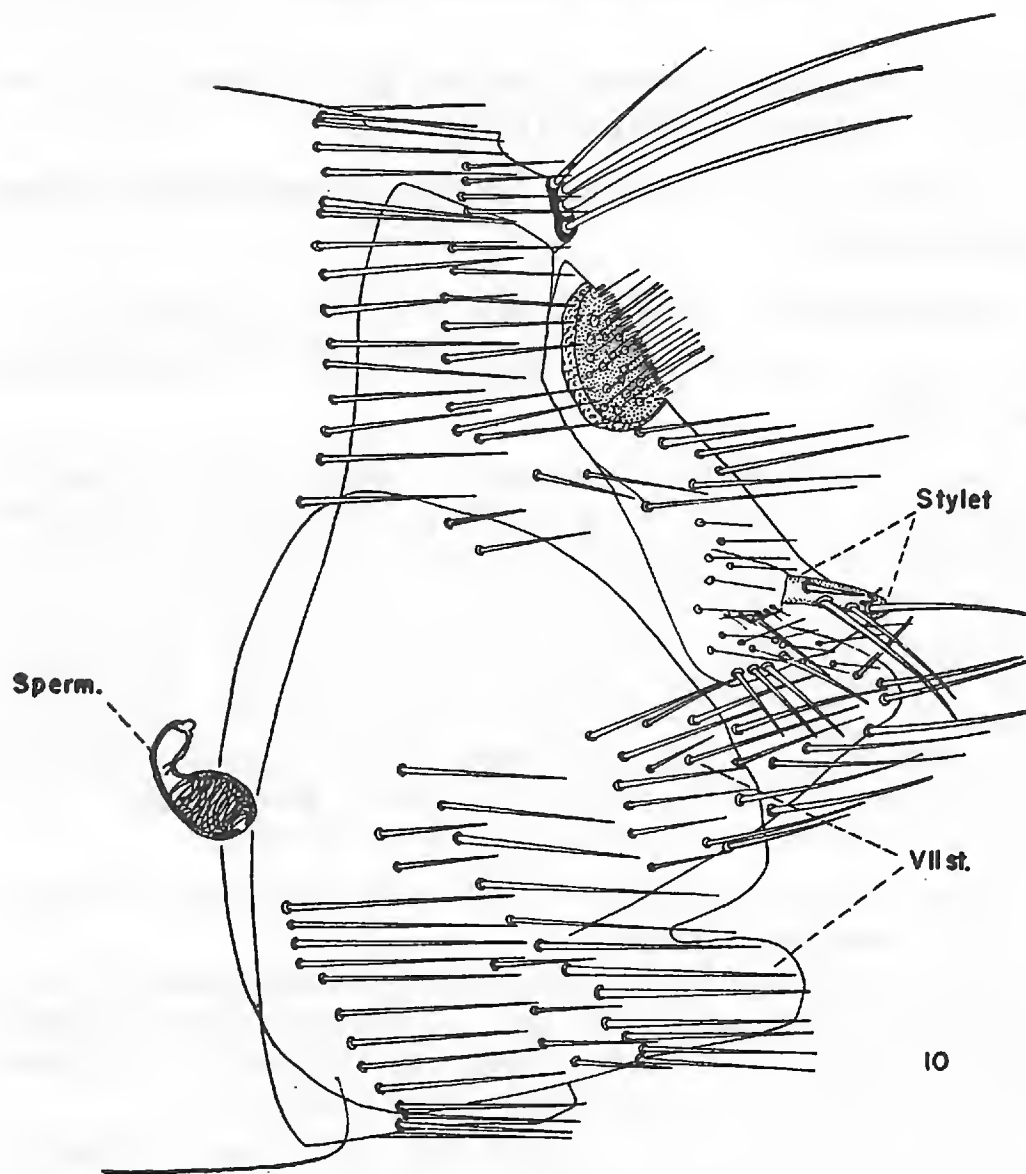
Dactylopsylla digitenua is closest to *D. pentachaeta*, but since it has some characteristics similar to *D. neomexicana* and *D. percernis*, these four fleas are probably subspecies of one another. However, until more specimens are obtained for comparison, the present nomenclature is maintained.

Measurements (length): Holotype male, 3.3 mm.

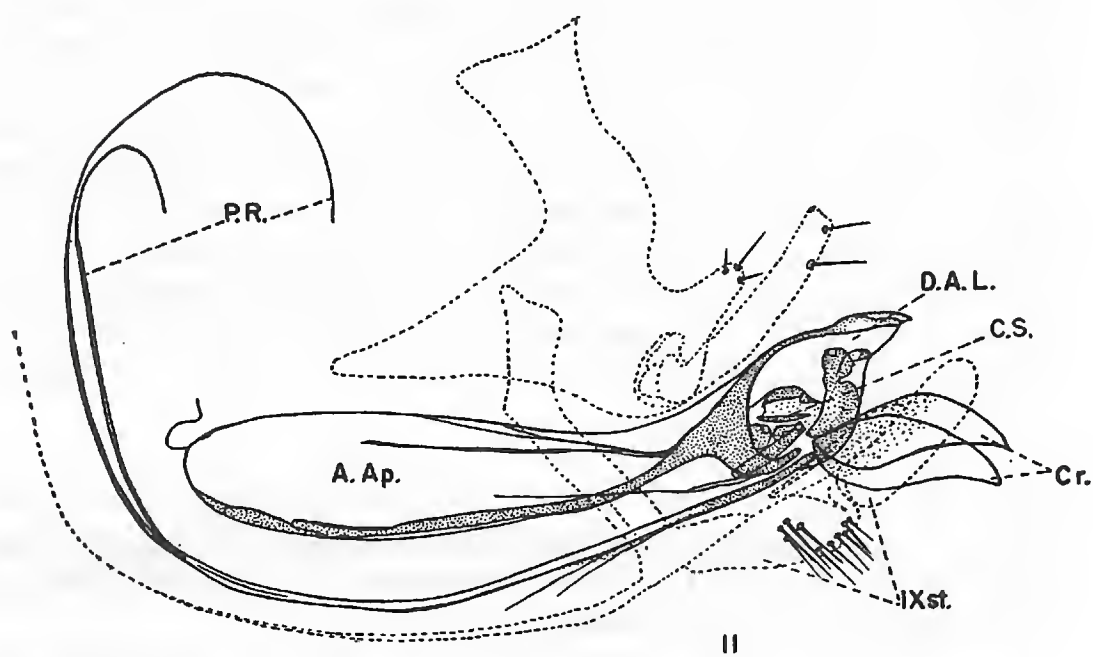
Type host: *Onychomys leucogaster* ssp. (true host probably *Geomys* sp.).

Type locality: 10 mi. W. MATADOR, 2,400 ft.; MOTLEY COUNTY, TEXAS. Ecological association: small streamside, mesquite, sage,

Fig. 10. *Dactylopsylla pentachaeta*, female. Fig. 11, *D. minidoka*, aedeagus.



D. PENTACHAETA SP. NOV.



D. MINIDOKA SP. NOV.

Geomys breviceps ssp. present. Collected by Mr. Frank Terry and Mr. Reino E. Raikko on May 3, 1950.

Holotype male on deposit at Western Communicable Disease Center Laboratory.

Dactylopsylla minidoka Prince and Stark, new species

This species (figs. 11-15) is closely related to *D. nuditenacula* Prince, 1945.

Head: Clypeal tubercle exceedingly small, more so than *D. nuditenacula*. Antennae of male extend little beyond posterior border of head. Scape large in male, without bristles in either sex. Pedicel of male with 6 setae reaching halfway along clava. Pedicel of female with 7 setae reaching beyond end of clava. Antennae of female do not reach posterior border of head. Single row in male, double row in female, of small setae above antenna. Two rows of thin medium-length setae on gena and one row of setae on posterior border of head. Only 4 bristles to each row on gena at most. Labial palps extend three-fourths the length of the fore coxa.

Thorax: Pronotal ctenidium with 23 teeth. Meso- and metathorax as in other members of genus.

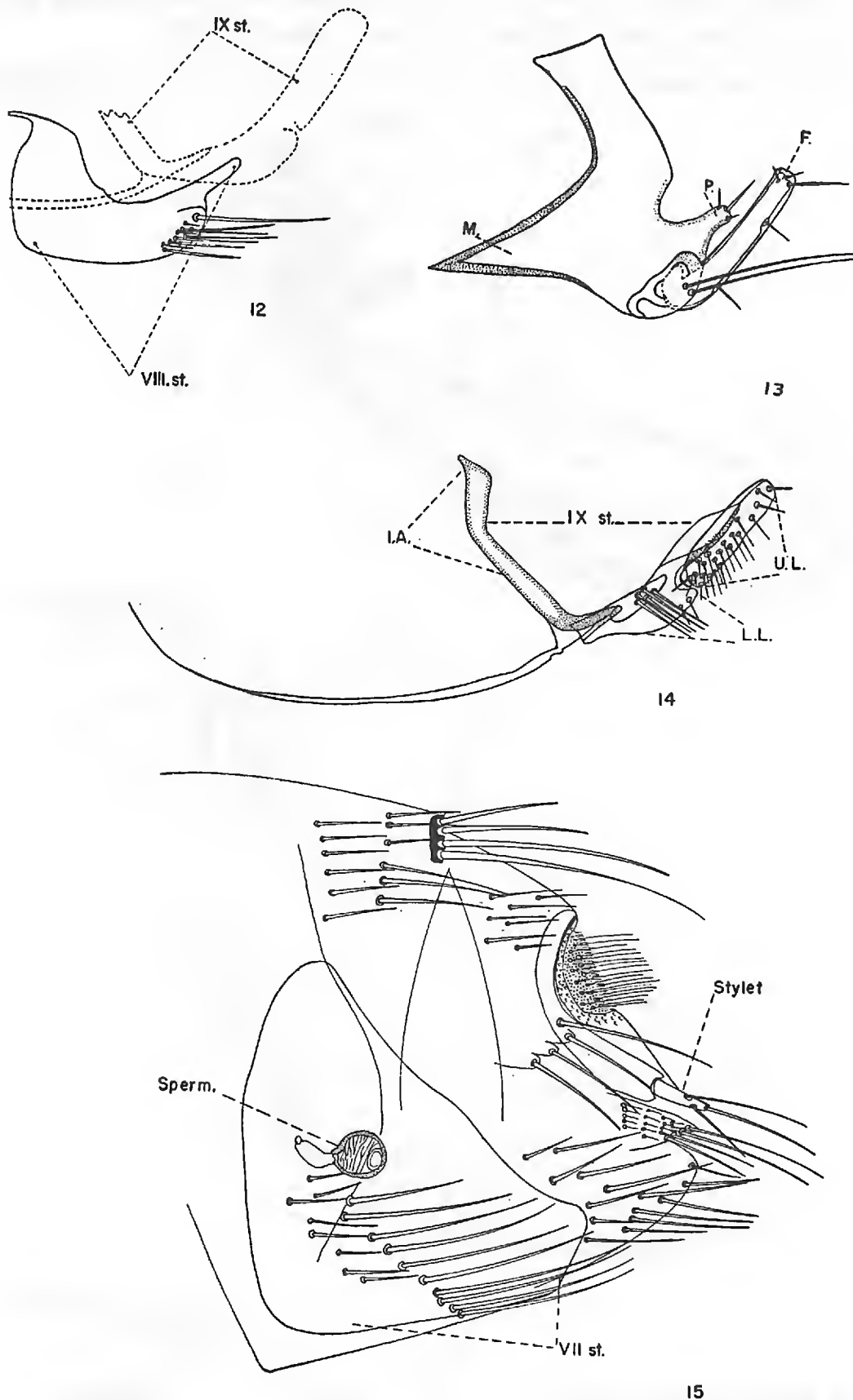
Abdomen: Over-all chaetotaxy similar to other members of genus. Antepygidial bristles 2 in male, with 1 small seta; 3 or 4 in female. Hind tibia has about 16 long, stout, dorsal bristles. All plantar bristles of segment V of tarsae are placed laterally.

Modified segments. Male: VIII tergum quite large, covering the greater part of the external genitalia. The VIII sternum is distinctive. The distal part is small and bears many bristles along the posterior ventral border. There is a long, narrow, distal process, having a rounded end and bearing no setae. The appearance of the VIII sternum is quite like that of *D. nuditenacula*. The IX tergum is small but distinctive. The manubrium is triangular in shape. The clasper is small and the dorsal process has a broad base, is not very long, and terminates with three small setae. The long, straight, narrow finger is quite similar to that of *D. nuditenacula* except that it bears 4 or 5 small setae laterally and along the posterior border. The internal arms of the IX sternum are narrow and smaller than in *D. nuditenacula*. The median lobe has an expanded posterior border (unlike *D. nuditenacula*) and bears several lateral setae. The upper lobe is large, bearing many thin setae and is similar to that of *D. nuditenacula*.

Female: The general outline of the posterior border of the VII sternum is similar to that of *D. nuditenacula* except that the lowest lobe is more pronounced, having an acute angle of 88 degrees, compared to 114 degrees for *D. nuditenacula*. The spermatheca and stylet are as in *D. nuditenacula*.

Measurements (lengths): Holotype male, 4.1 mm. Allotype fe-

male, 4.2 mm. Paratype males, 4.4 mm.; 4.1 mm.; 4.0 mm.; 3.9 mm.; average, 4.1 mm. Paratype females, 4.8 mm.; 4.8 mm.; 4.4 mm.; 4.3 mm.; 4.2 mm.; average, 4.5 mm.



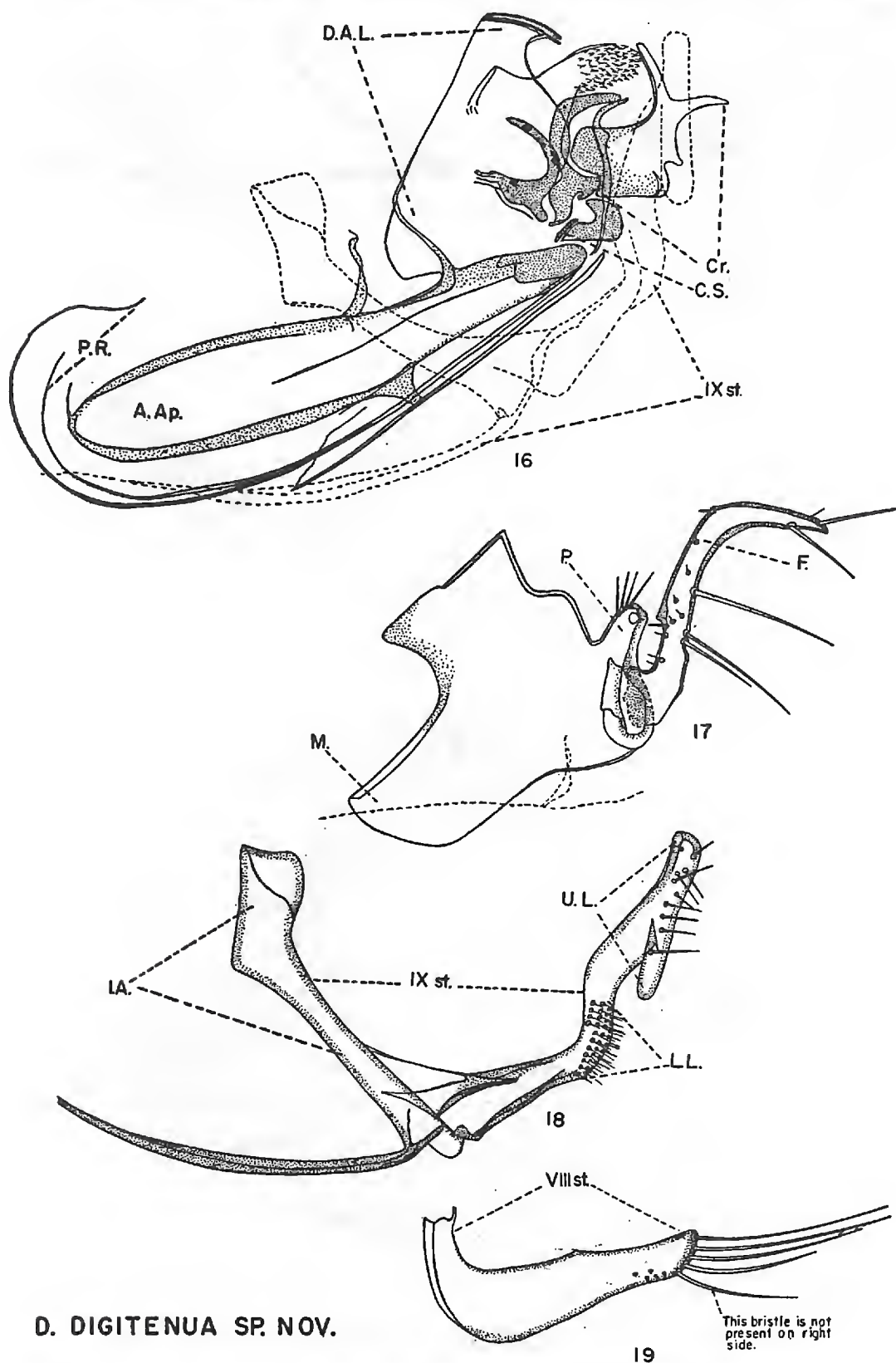
D. MINIDOKA SP. NOV.

Figs. 12-15, *Dactylopsylla minidoka*. 12, VIII sternum; 13, manubrium, clasper and finger; 14, IX sternum; 15, female.

Type host: *Thomomys talpoides gracilis* (Durrant, 1939).

Type locality: MINIDOKA NATIONAL FOREST, 7½ mi. S. E. Yost, on GEORGE CREEK, 6,500 ft., RAFT RIVER MTS., BOX ELDER Co., UTAH. Collected by Dr. Keith R. Kelson, May 11, 1947.

Holotype male and allotype female on deposit at U. S. National



D. DIGITENUA SP. NOV.

Figs. 16-19, *Dactylopsylla digitenua*. 16, aedeagus; 17, manubrium, clasper, finger; 18, IX sternum; 19, VIII sternum.

Museum. Paratype males and females at University of Utah Entomological Museum, Salt Lake City, Utah; at the Western Communicable Disease Center Laboratory; and at the British Museum (Natural History).

ABBREVIATIONS OF LETTERING ON FIGURES

A.	Aedeagus
A. Ap.	Aedeagal apodeme
Cr.	Crochet or aedeagal hook
C. S.	Crescent sclerite
D. A. L.	Dorsal apical lobe of aedeagus
F.	Finger of clasper lobe
I. A.	Internal arm of IX sternum
L. L.	Lower lobe of IX sternum
M.	Manubrium
P.	Dorsal process of clasper lobe
P. R.	Penis rods
Sperm.	Spermatheca or receptaculum seminis
St.	Sternum (of abdominal segment)
U. L.	Upper lobe of IX sternum

SELECTED BIBLIOGRAPHY

EADS, R. H. AND G. C. MENZIES

1949. A new flea from the pocket gopher. *Journal of Parasitology* 35 (2):171-174, Illus. Lancaster, Pennsylvania.

FOX, C.

1909. A new species of *Dolichopsyllus*—A genus of the Siphonaptera. *Entomological News* 20 (5):195-196, figures 1-4. Philadelphia, Pennsylvania.

JORDAN, K.

1929. Notes on North American fleas. *Novitates Zoologicae* 35 (1):37-38, figure 26. Tring, England.

JORDAN, K.

1933. A survey of the classification of the American species of *Ceratophyllus* s. lat. *Novitates Zoologicae* 39 (1):75. Tring, England.

PRINCE, F. M.

1945. Descriptions of three new species of *Dactylopsylla* Jordan and one new subspecies of *Foxella* Wagner, with records of other species in the genera (Siphonaptera). *Canadian Entomologist* 77 (1):15-20, figures 1-7. Guelph, Canada.

SEAL CONTEST

The contest for an official seal for the Pacific Coast Entomological Society, announced in our January issue, was won by Mrs. L. R. Gillogly, Sacramento, California.

THE CADDISFLY GENUS ANAGAPETUS

(Trichoptera: Rhyacophilidae)

HERBERT H. ROSS

Illinois Natural History Survey, Urbana, Illinois

At the time of its original description, *Anagapetus* Ross was considered a subgenus of *Agapetus* chiefly because it lacked any of the specialized male secondary sexual characters which typify most groups of *Glossosoma*, its only other relative. More recently I have been fortunate in obtaining larvae and pupae of *Anagapetus*, and these stages, together with a more detailed study of the adults, have shed considerable light on the phylogeny of the entire complex.

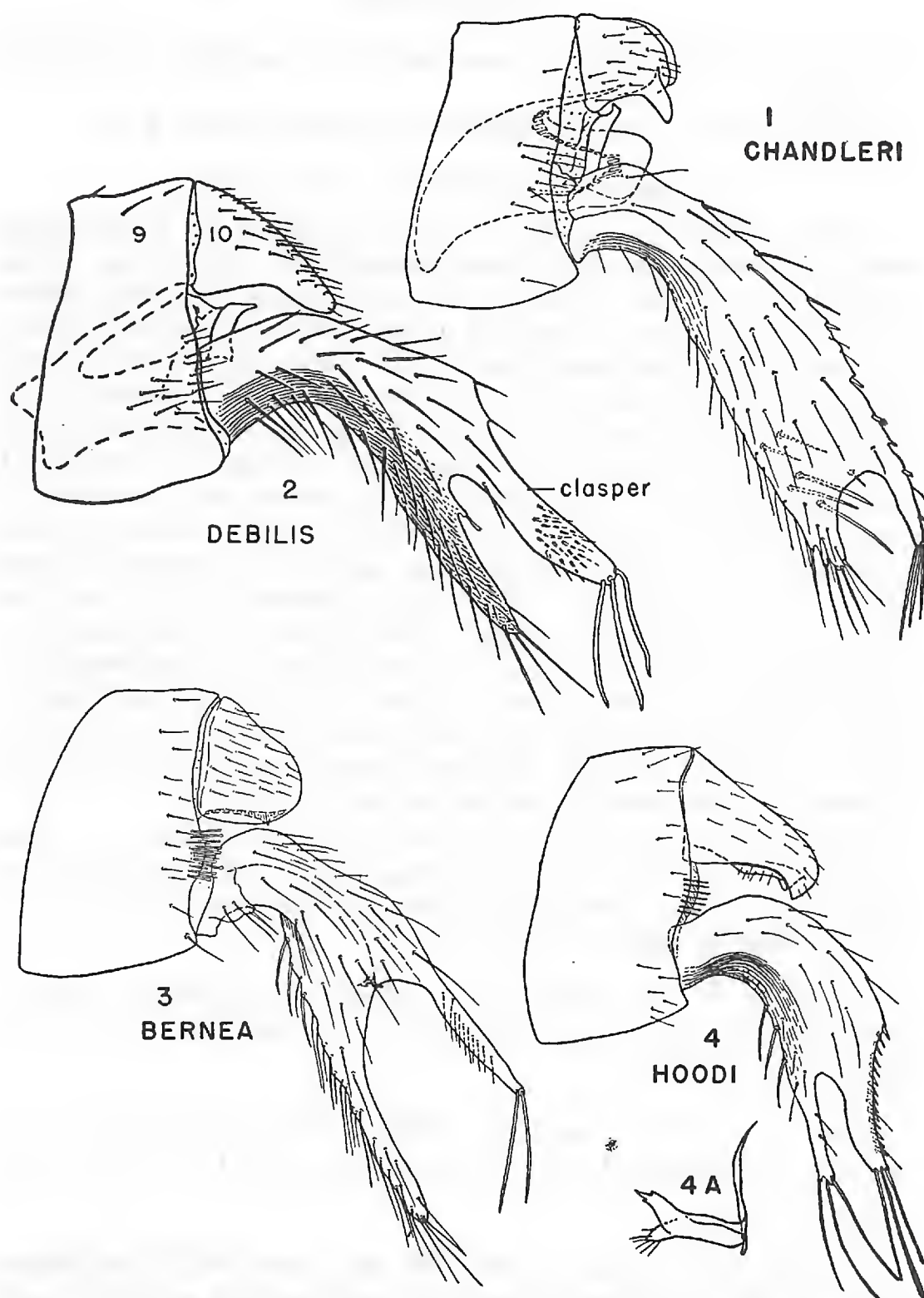
The larva of *Anagapetus* is virtually indistinguishable from that of *Agapetus*, the front leg being attached near the midpoint of the lateral margin of the pronotum. The pupa is more or less intermediate between *Agapetus* and *Glossosoma*, the mandibles having one of the preapical teeth a little more prominent than the other, in this way suggestive of *Glossosoma*. The adult lacks completely the specialized conditions which mark both *Agapetus* and *Glossosoma*; the hind wing has a full complement of veins, as in *Glossosoma*, and in this respect differs from the reduced venation typical of *Agapetus*; the front wing lacks the callosity and realignment of veins typical of *Glossosoma*; the legs have simple tibial spurs and the abdomen of the male has the lateral plate on the fifth segment only slightly developed in contrast with the highly specialized condition found in *Agapetus*. The adult of *Anagapetus* has only a single transverse wart on the mesoscutellum; both *Agapetus* and *Glossosoma* have a pair of small warts on this sclerite.

From this it would seem that *Anagapetus* is the most generalized group of the complex and represents the known existing form closest to the common ancestor of both *Agapetus* and *Glossosoma*. *Glossosoma* apparently diverged in one direction, developing distinctive characteristics especially in the larva and in the male, and *Agapetus* diverged in another direction, developing distinctive wing characters in the adult with little change in the larva or pupa.

It would seem from this that *Anagapetus* is an archaic remnant of an old phyletic stem. It is represented by only four known species distributed locally through the western montane region of North

America, from California to southern British Columbia. These four species are very closely related which would indicate that only one small branch of the genus has yet been unearthed, and that other branches are either extinct, rare, or occur in regions of the world which have not yet been well collected.

It is interesting that *Glossosoma* has developed into the dominant



Figs. 1-4. Male genitalia of *Anagapetus*, lateral aspect; fig. 4A, posterior aspect of mesal process at base of clasper.

saddle-case maker of the cold and rapid streams, especially abundant in mountainous areas. *Agapetus*, on the other hand, has moved towards warmer streams and is found most abundantly in the brooks of rolling and less mountainous terrains. In contrast, *Anagapetus* is relatively uncommon, and is known only from the slower small streams and brooks in the western mountains.

ANAGAPETUS Ross

Agapetus subg. *Anagapetus* Ross, 1938, Ill. Nat. Hist. Surv. Bull. 21:109.

Genotype by original designation: *Agapetus debilis* Ross.

Anagapetus chandleri Ross, new species

Male—Length from front of head to end of wings, 5 mm. Color very dark brown, the legs below coxae lighter brown, the wings uniformly smoky brown. General structure typical for genus. Abdomen with a triangular projection on each side of fifth sternite, the two joined by a transverse ridge. Sixth sternite with a small mesal projection, seventh sternite with a slightly larger truncate mesal projection. Genitalia as in fig. 1. Ninth segment annular, with only scattered hairs on the side. Tenth tergite divided into a pair of lateral sclerotized lobes each with a membranous mesal area and with a toothlike ventrolateral projection. Clasper elongate, curved at base, incised for about a fifth of its length at apex to form a narrow dorsal and a wide ventral process; dorsal edge of clasper with a few short stout spines, remainder of clasper with long slender hair except for a few longer, stouter setae at tips of apical processes and along inner margin near apex; mesal area at base of clasper produced into a narrow vertical sclerite with a slight hook at its apex. Between these is exerted the small, elliptical, simple aedeagus which bears internally a sclerotized thickening as shown in fig. 1.

Female—Size, color, and general structure similar to male. Abdomen with paired lateral swellings on the fifth sternite as in male, sixth sternite with a large truncate apicomesal process, seventh and eighth segments simple.

Holotype, male.—Two miles southeast of MARIPOSA GROVE, MARIPOSA COUNTY, CALIFORNIA, elevation 7,000 feet, August 27, 1946, H. P. Chandler.

Allotype, female.—Same data. Both holotype and allotype deposited on permanent loan in the collection of the California Academy of Sciences.

This species is readily identified by the short cleft of the clasper, the finger-like ventral processes of the tenth tergite, and the row of widely separated short spines on the dorsal margin of the clasper.

Anagapetus hoodi Ross, new species

Male—Length from front of head to tip of folded wings, 6 mm. Color very dark brown, in life appearing black, with the legs below coxae yellowish-brown. General structure typical for genus. Fifth, sixth, and seventh segments with structures and processes as described for *chandleri*. Genitalia as in fig. 4. Ninth segment annular, its posterior margin with a lateral comb of clavate setae between bases of clasper and tenth tergite. Lobes of tenth tergite a little longer than dorsal length of ninth segment, concave beneath so that each lobe has a mesal and lateral ventral angulation at tip. Clasper sharply curved just beyond base, and beyond this point enlarged into a wide, mesally concave structure incised at apex approximately one-third its total length; the dorsal process so formed is wide, bears usually three long setae at apex, and has a dorsal row of about 15 short, sharp spines which arise on the mesal side and project above the dorsal edge of the profile; ventral arm slender, bearing 3 or 4 long setae at tip. At base of clasper is a narrow mesal process which projects dorsad; this is not angled at tip as in *chandleri* but bears two or three short spurs, fig. 4A. Aedeagus short, ovoid, very similar to that of *chandleri*.

Female—Length 7 mm., color and general structure as for male. Abdominal segments simple and tubular, and indistinguishable externally from other species in the genus.

Holotype, male.—NORTH FORK of IRON CREEK, MT. HOOD, OREGON, July 30, 1948, Kenneth M. Fender.

Allotype, female, and one *paratype*, male.—Same data. All deposited in the collection of the Illinois Natural History Survey.

ANAGAPETUS BERNEA Ross

Anagapetus bernea Ross, 1947. Trans. Am. Ent. Soc. 73:131. ♂, ♀.

To date this species is known only from Hood River County, Oregon, and Berne, Washington, both localities in the heart of the Cascade Mountains.

ANAGAPETUS DEBILIS Ross

Agapetus debilis Ross, 1938. Bull. Ill. Nat. Hist. Surv. 21:108. ♂.
Anagapetus debilis Ross, Denning, 1949. Can. Ent. 80:113. ♀.

Originally described from Logan Canyon, Utah, additional records of this species extend its range through many areas of the Rocky Mountain ranges from Colorado to eastern Oregon, as follows: COLORADO—Green Mt. Falls: July 12, 1938, larvae; June 14, 1938, pupae, larvae; June 23, 1938, larvae; June 4, 1938, stream No. 1, pupae. West Creek: July 5, 1938, larvae, pupae.

Rocky Mountain National Park: Chiquita Creek, July 27, 1938, 3 ♀. UTAH—Beaver, June 26, 1942; Logan Canyon, Spring Hollow: July 17, 1938, ♂, ♀; July 21, 1938, ♂; Timpooneke Guard Station, Wasaben National Forest: Aug. 26, 1943, ♂, ♀; Maple Canyon, June 1, 1939, ♂. WYOMING—Fox Park: July 4, 1938, ♂, ♀; Wilson: Aug. 12, 1940, Coal Creek, ♂, ♀; Yellowstone National Park: Dunraven Pass, Mt. Washburn, Aug. 2, 1940, ♂; Specimen Creek, Station 5, Aug. 6, 1947, 6 ♂ ♀. OREGON—Durkee: Powell Creek, June 13, 1947, 5 ♂ ♀. MONTANA—Glacier National Park, Sprague Creek, July 11, 1940, ♂ ♂, ♀ ♀.

In each place in which I have collected this species it has occurred in a brook-type of stream rather than a more rapid cascading mountain creek. In no case have I taken them in the same stream with *Glossosoma*; the mountain species of this latter genus occur in the larger and more rapid streams.

KEY TO SPECIES—MALES

1. Apex of clasper only shallowly incised, lower margin not forming a slender finger; each lobe of tenth tergite with a thumblike lateral projection; fig. 1 *chandleri*
 Apex of clasper with a deep incision forming an upper and a lower finger-like process; tenth tergite at most with angulate corners, never with thumblike projections; figs. 2-4 2
 2. Lateral lobes of tenth tergite short and deep, fig. 3; baso-mesal process of clasper extending backward so that it is almost indistinguishable from lateral view *bernea*
 Lateral lobes of tenth tergite longer than deep; baso-mesal process of clasper extending almost directly dorsad and easily seen from lateral view, figs. 2, 4 3
 3. Dorsal arm at apex of clasper with a mesal cluster of fairly long setae, fig. 2 *debilis*
 Dorsal arm at apex of clasper with a mesal row of short spines along dorsal edge, and projecting above it, fig. 4 *hoodi*
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THE
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Published by the
Pacific Coast Entomological Society
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San Francisco, California

1951

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Entered as second class matter, February 10, 1925, at the post office at San Francisco, under act of August 24, 1912.

The Pan-Pacific Entomologist

VOL. XXVII, No. 4

October, 1951

DUDLEY MOULTON

Dudley Moulton was born on a fruit ranch near San Jose, California on December 29, 1878. At the age of 73 years he died at Pasadena, California, July 5, 1951. Following a period of poor health he had recently moved from his home of long-standing at Redwood City to that of his son at San Gabriel, California.

His early interest was in agriculture and its problems and he majored in entomology at Stanford University. He studied under the noted Vernon Kellogg and was graduated with an A.B. in 1903. Three years later he received an M.A. from the same institution.

During the period 1904-1906 he was entomologist for Santa Clara County and was the first to work out the biology and control of the pear thrips, at that time a new and most serious fruit pest (Howard, 1933). His first publication was about this insect, in 1905. In the three year period which followed he was in the employ of the Bureau of Entomology, U. S. Department of Agriculture, as a Special Agent, Deciduous Fruit Investigations, studying various fruit pests in Nebraska, Missouri, Arkansas and California. In addition to his well-known publications on the pear thrips, he wrote on the California peach borer (Essig, 1931). In 1909 he described his first new species of thrips, the citrus thrips, still a well-known and important economic pest. In this same year he was appointed Deputy State Commissioner of Horticulture for California, serving in this capacity until 1915. During the greater portion of this period he was in charge of the Quarantine Division at the city and port of San Francisco. In 1915 he assumed the duties of Agricultural Commissioner for the city and county of San Francisco. As trade representative for the Sacramento Region Citizen's Council, he spent several months in 1929 in South America developing better trade relations between California and the nations to the south. As a result of this trip the Pan-American Reciprocal Trade Conference was held in Sacramento in 1930.

In July 1931, Mr. Moulton was appointed Director, Department of Agriculture, State of California, which position he held until January 1933. While in office at Sacramento he created a Division

of Entomology and Pest Control and was active in developing the Agricultural Marketing Act (Tucker, 1931).

To professional entomologists, both in this country and abroad, he was known as a leading authority on the insect order Thysanoptera. As a result of his early work on the pear and citrus thrips he began collecting thrips and developed a lasting interest in their taxonomy. Following the publication of his Catalog of North American Thysanoptera in 1911 he gained wide recognition, expanded his world-wide collection, catalog and library. From 1926 on he published steadily and his papers totaled 75 (Bailey, 1949) which include descriptions of 47 new genera and subgenera and 480 new species and varieties. His imposing collection and library, which are deposited in the Entomology Department at the California Academy of Sciences, Golden Gate Park, San Francisco, are continually referred to by authorities and students of this group of insects. There are some 25,000 prepared slides, and much unmounted material.

He also helped and encouraged many contemporary and younger workers, notably F. Andre, P. R. Jones, A. C. Mason, A. C. Morgan, J. R. Preer, K. Sakimura, J. B. Steinweden, J. G. Watts, and the writer. In this respect he was most generous and hospitable in receiving fellow scientists into his home at Redwood City, making available his collection and library, and in loaning valuable specimens for study. His uppermost thought was to share his findings and further the scientific knowledge on Thysanoptera. His correspondence was world-wide and he remained in touch with entomologists in many countries by a prompt and generous exchange of specimens and personal helpful notations. His name will remain prominent in entomological literature.

His writings on subjects other than thrips were as follows:

- 1905. Report of the County Horticultural Commissioner. Santa Clara County. First Bien. Rpt., Comm. Hort., State of Calif. for 1903-04, pp. 177-180.
- 1911. The California peach tree borer. Calif. Cultivator, 36:734.
- 1911. The California peach tree borer. U. S. Dept. Agric., Bureau Ent., Bull. 97, part IV, pp. 65-69, pls. VIII - IX.
- 1931. Financing perishable shipments. First Pan-Amer. Recip. Trade Conf. Monthly Bull., Dept. Agric., State of Calif. 20(9):88-91.
- 1932. The California Plan: Its origin and development. Monthly Bull., Dept. Agric., State of Calif. 31(4-6):248-254.

At various times he was a member of the following societies: Sigma Xi, Pacific Coast Entomological Society, American Association of Economic Entomologists, California Academy of Sciences and a Fellow in the Entomological Society of America.

Mr. Moulton is survived by his wife, Maude C. Moulton, two sons, Robert C. and Kenneth C. Moulton, and two sisters, Josephine and Lina.

BIOGRAPHICAL REFERENCES

BAILEY, S. F.

1949. An annotated bibliography of North American Thysanopterists: Part III. *Florida Ent.* 32(3):114-131.

ESSIG, E. O.

1931. *A History of Entomology*. Macmillan, New York, pp. 98, 99, 238, 240, 886.

HOWARD, L. O.

1933. *Fighting the Insects*. Macmillan, New York, pp. 159-160.

TUCKER, T. C.

1931. The new Director of Agriculture. *Monthly Bull., Dept. Agric., State of Calif.* 20(7):418.

Stanley F. Bailey,
University of California, Davis

BULLETIN OF ANIMAL BEHAVIOUR (Journal of the Association for the Study of Animal Behaviour). Cromwell House, Huntington, England.

This journal began publication in October, 1938, and parts of Volume 1 have appeared at irregular intervals. The most recent, No. 9, March, 1951, is largely entomological. It contains translations from the German of three articles by K. von Frisch: 1) Solved and unsolved problems of bee language (from *Die Naturwissenschaften*, 1948, Heft 1:12-23 and Heft 2:38-43), 2) The polarisation of light from the sky as an orienting factor in the dances of the honey bee (from *Experientia*, 5:142-148. 1949), and 3) The sun as a compass in the life of honey bees (part of summary only, from *Experientia*, 6:210-221. 1950).

Number 5, December, 1947, contains "The dances of the honey bee" by von Frisch, with a preface to the English translation by W. H. Thorpe. It is available at the above address for 2s. 6d.; No. 9 costs 7s. 6d.—H. B. L.

ZOOLOGICAL NOMENCLATURE: NOTICE OF PROPOSED
SUSPENSION OF THE RULES IN CERTAIN CASES FOR
THE AVOIDANCE OF CONFUSION AND THE VALIDATION
OF CURRENT NOMENCLATORIAL PRACTICE (A. (n.s.) 9)

Notice is hereby given that the possible use by the International Commission on Zoological Nomenclature of its plenary powers is involved in applications relating to the under-mentioned names included in Parts 9/10 of Volume 2 of the *Bulletin of Zoological Nomenclature*, which will be published on 15th August, 1951:—

- (1) *Entamoeba* Casagrandi & Barbagallo, 1895, *Endamoeba* Leidy, 1879, and *Poneramoeba* Lühe, 1909 (Class Rhizopoda) (action designed to validate existing practice) (pp. 243-281) (File 185).
- (2) *dentatus* Diesing, 1839 (as published in the binominal combination *Stephanurus dentatus*) (Class Nematoda) (question whether this name should be preserved for the kidney worm of swine) (pp. 282-293) (File 188).
- (3) *Eysarcoris* Hahn, 1834 (Class Insecta, Order Hemiptera) (proposed validation of existing nomenclatorial practice) (pp. 294-5) (File 212).
- (4) *acuminata* Ioff & Tiflov, 1946 (as published in the combination *Rhadinopsylla (Rectofrontia) acuminata*) (Class Insecta, Order Siphonaptera) as applied to species No. 68 (proposed elimination of homonymy caused by printer's error) (pp. 296-7) (File 386).

Any specialist who may desire to comment on any of the foregoing applications is invited to do so in writing to the Secretary to the International Commission (address: 28 Park Village East, Regent's Park, N. W. 1. England) as soon as possible. Every such comment should be clearly marked with the Commission's File Number as given in the present Notice.

THE SUCKING LICE, by G. F. Ferris. This 320-page book, the first of the Pacific Coast Entomological Society's "Memoir Series", was published on October 19. It will be reviewed in a later number of this journal.

NOTES ON INSECTS ASSOCIATED WITH LUPINUS
POLYPHYLLUS LINDL. IN THE PACIFIC NORTHWESTL. P. ROCKWOOD¹*Bureau of Entomology and Plant Quarantine, Agricultural
Research Administration, United States Dept. of Agriculture*

About thirty years ago the writer, with some assistance,² studied the insects associated with a native lupine, *Lupinus polyphyllus* Lindl. (Piper and Beattie 1915). This lupine frequently occurs on the edges of wet unplowed meadows in the Tualatin Valley, a western arm of the Willamette Valley in Oregon. The stems, sometimes four or five feet tall, with their long racemes of pale violet flowers and large palmate leaves are conspicuous in the plant associations in which they occur. The stems are $\frac{3}{8}$ inch or more in diameter, thick-walled, and hollow except for a few inches of solid pith at the base.

Now that the writer has the time and inclination to return to his notes on the interesting group of insects associated with this plant, this lupine has disappeared from some of the nearby places where it formerly was abundant and in other places it has been damaged by the trampling of cattle. Hence the deductions from the original observations on the habits of certain of the insects infesting it, which were doubtful in some cases, cannot now be verified. However, as no information has been published on most of the species of insects, at least five of which were not known before our material was sent to taxonomists, it seems worth while to record the original observations.

The abundance of nicks in the edges of the leaflets first attracted the writer's attention to this plant in May, 1918. It was soon noted that the nicks were caused by the feeding of a large sitona beetle, which was identified as *Sitona californica* Fahraeus by W. D. Pierce in 1919. Upon further investigation in May, 1919, stem maggots were found in the bases of the flower stalks and a lepidopterous borer, which caused the large palmate leaf or the flower raceme to wilt, was present in the stems. Later other maggots were found in the stems and lepidopterous and coleopterous miners in the roots. In all, 10 species of probably injurious insects were

¹Retired October 31, 1948.²Mrs. S. K. Zimmerman (*née* Keen) and Max M. Reeher.

noted on this host plant. In addition, a small, black sphecoid wasp and a leaf-cutting bee with its nearly-related inquiline were found utilizing the large stems as nesting places, after the stems had been damaged by other insects.

LEPIDOPTERA

PAPAPEMA PERTINCTA Dyar

Of the Lepidoptera the most interesting species was a stem borer that Dyar (1920) described as *Papaipema pertincta* from moths that had been reared from this host plant. The first indication that larvae of this species were at work was the wilting of the large leaves or the flower stalks in May. When the stems were split, the small larvae, probably then only in their first or second instar, were discovered actively feeding up and down inside the hollow stems, eating into the side walls as they went, even up close to the tip of the flower stalks. In spite of their small size, the larvae seriously affected the circulation in the large stems, causing them to wilt.

At this time the larva was a very active semi-looper, Van Dyke-brown with conspicuous whitish dorsal and subdorsal lines on the last two thoracic and last five abdominal segments, with the dorsal line only faintly indicated on the intervening segments. The thoracic shield and head were shining straw-color with a Van Dyke-brown streak on the sides of the face prolonged onto the thoracic shield.

As the larvae continued to work, the stems of the plant often broke off at points weakened by their feeding. By July the larvae were full-grown and were located in the stalk at the crown. This part of the stalk was originally solid pith but had been eaten out to form a pupation chamber. In each case a hole for emergence of the moth had been eaten in the stem well above the pupation chamber and about an inch above the surface of the ground. Frass had been expelled through this hole.

On August 7, 1924, a prepupal larva was described as follows: 36 mm. long by 6 mm. wide, dully shining, dirty white, without lines; head chestnut brown, thoracic shield auburn with black lateral margins, the median pale line faint; setae black on dark brown spots, spot around seta I, on abdomen, about three times as large as that around II except on abdominal segment 8 where both are transverse and subequal, the transverse oval spots around setae I and II cover most of the dorsum on abdominal 9, spot around seta III about like the one around II, that around III^a small

but distinct, the one around IV larger than the one around I, those around setae V and VI large, subequal, but paler; anal shield raw umber; tarsi almost black; proleg plates large but pale; claws black; spiracles black.

Pupation occurred in early August and the moths emerged in September. This species was parasitized in the early stages by an undetermined species of *Sagarites* and in the later stages by the braconid *Microplitis gortynae* Riley (determined by C. F. W. Muesebeck in 1922), the gregarious larvae of which emerged from the prepupal larva and spun their cocoons in the pupation chamber.

HYSTRICOPHORA PARADISIAE Heinrich

Another lepidopteron was a miner in the roots. This species did not come to our attention until we had dug up and caged the crowns and part of the roots of several of the plants to obtain pupae of the stem borer. Considerable numbers of pupae were found the following spring projecting from mines in the roots. A few of these root borers, in the larval stage, were later found in roots of the older plants. Pupal cases, with one end stuck in the ground and standing upright but empty, were found around the plants in the field. In the laboratory, moths emerged in May of the year following collection. Upon examination of the root crowns from which they had issued, it was found that very little sound plant tissue was left. The pupal chambers had been formed just under the surface of the root and were lined with white silk. An exit hole had been formed, through which the pupa had forced its way before the moth emerged. This species was determined by Carl Heinrich in 1922 as *Hystricophora paradisiae*, and was described by him (Heinrich, 1923) from specimens taken in Paradise Valley on Mt. Rainier in Washington.

COLEOPTERA

SITONA CALIFORNICA Fåhraeus

The coleopteron *Sitona californica* was usually rather abundant wherever this lupine occurred. The typical feeding notches of the adults on the edges of the leaflets were often so numerous as to give the leaflets the appearance of being irregularly dentate. Copulation and oviposition were observed in May. The eggs were often laid on the stems near the ground. The short-oval (nearly round) eggs are white at first but turn black if fertile (like those of all other sitonas known). The larvae feed on the large nodules on the roots.

These nodules are much larger than those on other leguminous plants, and this species of *Sitona* is larger than any other found in the region. The larvae reach maturity in July and pupate near the surface of the ground. The adults probably emerge in July.

ANOPLODERA INSTABILIS Haldeman

Occasionally coleopterous larvae were found in mines in the roots in July and August. These larvae were recognized as cerambycids, but the species was not reared until May 30, 1928, when adults emerged from roots collected in August, 1927. The adults were determined as *Anoplodera instabilis* by W. S. Fisher in 1930.

APION sp.

An undetermined species of *Apion* was observed on the flowers of the lupine in May and June.

DIPTERA

EREMOMYIA sp.

Some of the most interesting insects associated with this plant were Diptera. In May, 1919, a few maggots were found in the bases of the flower stalks near the ground level where the stem was solid pith. These maggots pupated on May 15 and two flies emerged on June 13. One of the flies was sent to Washington and the other was given to Frank R. Cole who in turn sent it to J. R. Malloch along with a specimen that he had obtained by sweeping. J. M. Aldrich determined the specimen sent to Washington as *Eremomyia* in 1920. It is not known whether Malloch, who was working on the genus at that time, described the species.

PHYTOMYZA ALBICEPS Meigan

On July 8, 1919, several small puparia were collected in debris inside the hollow part of the stems where *papaipema* larvae had also worked. On July 5, 1920, both larvae and puparia were observed and it was noted that the larvae had worked from the solid pithy core of the stem near the crown up the inside of the hollow stems, in the side walls, for two or three inches, causing a rusty color in the affected plant tissues. Flies emerged in March and April from material that had been kept over winter in the laboratory. These flies were determined as *Phytomyza albiceps* by J. M. Aldrich in 1921.

CHYLIZA LEGUMINICOLA Melander

On July 8, 1919, crowns and lower parts of the stems containing puparia were collected. These puparia were firmly held in the tissues of the crown, which the larvae had apparently mined. Adults emerged in March of the following year. The flies were swept from the host plants in April. Melander (1920) described this species from the writer's material as *Chyliza leguminicola*. In July, 1921, Miss Keen noted the larvae working in the base of the stems and in the crowns. In August, 1921, the writer collected infested crowns from which 39 individuals of this species and 49 specimens of another species emerged the following spring. On August 7, 1924, it was noted that the chyliza larvae worked in the crown of the lupine where the stem was originally solid. When full-grown and ready to pupate, they often mined downward into the root. The flies rarely attempted to fly when emerging in the laboratory but were quick to jump, like some chalcids.

LONCHAEA HIRTITHORAX Aldrich

On August 19, 1921, large numbers of maggots were found in a writhing mass where the stem of the lupine joined the crown, a part that is solid in undamaged plants. These larvae were thought to be *Chyliza* sp., but they were found to be of another species. In all, 49 specimens were reared. The species was described as *Lonchaea hirtithorax* by Aldrich (1925). On August 7, 1924, the lonchaea larvae were observed feeding in the thick walls of the lupine stems, near the crown but in the hollow part. They were not so abundant as they had been in 1921. By the time this species was feeding actively, the host plant had matured its seed and was on the decline. This species was still in the larval stage in August when chyliza larvae had pupated.

LYCORIA sp.

In May, 1922, *Lycoria* of an undetermined species were reared in considerable numbers from the roots and crowns that had been collected the previous summer.

HEMIPTERA

MACROSIPHUM ALBIFRONS Essig

The aphid *Macrosiphum albifrons* Essig has also been found on this lupine.

HYMENOPTERA

SOLIERELLA SIMILIS (Bridwell)

On August 17, 1920, a few nests of a sphecoid wasp were found in the flower stalks that had been broken off, part way down from the top, where they had been weakened by the feeding of *papaipema* larvae. One of these nests was in a stalk that had been broken near the crown, where it had been weakened by stem maggots, and was lying almost recumbent. In this case the wasp must have had to reverse its usual habit of forming its cells from the bottom up. The brood chambers were usually three to four in number and filled with three to six paralyzed but still living early stage grasshoppers of the genus *Melanoplus*, packed around with pellets of earth. The flimsy partitions between the cells, and the filling above the last cell, were formed of chaff, grass and weed seeds, small pieces of twigs, bird and insect excreta, and even a few very small berries. In one nest all the grasshoppers had been consumed and all the wasp larvae were in cocoons coated with fine dirt from the earth pellets. In another nest the two lowest chambers contained cocoons, the next higher chamber had a well-grown larva consuming one of the last grasshoppers, and the chamber nearest the top contained four grasshoppers with a small larva attached to one of them.

On August 24, 1920, two nests were discovered in lupine stems in a different locality from that of August 17. One of these nests was similar to those previously found and contained only cocoons, but the other was constructed differently, with only two large brood chambers, which contained more vegetable debris than earth pellets and 31 grasshoppers with only two well-grown larvae. The latter nest may have belonged to another species of wasp.

On August 19, 1921, Miss Keen found several of these nests in the lupine stems. All the wasp larvae were in cocoons and the provisions of grasshoppers had been consumed. Wasps that emerged from this material on June 28, 1922, were determined by S. A. Rohwer as *Silaon* n. sp. in 1922 and in 1924. These specimens are now in the U. S. National Museum under the name of *Solierella similis* (Bridwell), having been so identified by Francis X. Williams.³ A few parasites were also reared from cocoons of this wasp and were determined as *Tetrastichus* n. sp. by A. B. Gahan in 1923.

³Letter from C. F. W. Muesebeck, dated August 16, 1949.

On August 7, 1924, the writer found a nest that measured 13 inches over all and had 10 cells. The five lowest cells contained cocoons and the next three contained larvae. In the last cells there were 8 grasshoppers in one and 6 in the other, but no wasp larvae or eggs. These two cells were close together, with only a thin layer of trash between them and between the lower of the two and the next cell. The top end of the nest was filled with lumps of earth and other debris, dropped in haphazardly. The grasshoppers showed slight reflex movements when pressed on the sternal plates. Evidently these wasps began work early in July soon after emergence from the cocoons in which they had overwintered. At that time the grasshoppers would still be rather small in the wet places where the lupine grows as they hatch later in that area than elsewhere. The grasshoppers in the nests, probably *Melanoplus femur-rubrum* Degeer, were in the early nymphal stages.

MEGACHILE BREVIS Say, and COELIOXYS sp. near MOESTA Cresson

On August 7, 1924, the writer found a nest of a leaf-cutting bee in a hollow stem that had about one-third of the top broken off, probably because of damage by the *Papaipema* stem borer. This nest was $2\frac{3}{4}$ inches long and contained five cells. The partitions between the cells were made of three green leaves on top of each other with two pieces of rose petal, laid very closely together, as a cap to the cell below. The completed nest was about one inch below the opening of the hollow stem, and the stem above the last cell was filled with pieces of green leaves dropped in haphazardly. Another similar nest in the course of construction was observed. The last cell was formed of rose petals, still bright, and was open at the end and empty. Two completed cells below contained "bee bread" and one egg each. The eggs were attached to the side of the cell a few millimeters above the food. A newly hatched larva was seen but it was met and killed by a larger larva with large strong jaws, which had worked up through the "bee bread" in the bottom of the cell. In July of the following year, five bees of two species emerged from the undamaged nest. In 1927 Miss Grace Sandhouse determined one of these as *Megachile brevis* Say and the other four as *Coelioxys* sp. near *moesta* Cress. The latter species is an inquiline, and the larva with strong jaws noted above was probably this insect.

An intensive study of *Lupinus polyphyllus* would doubtless reveal other insects closely associated with it. The notes given in

this paper indicate that ecological studies of the insects associated with plants native to the Pacific Northwest would increase our knowledge of the insects of that region, some of which might eventually be of considerable importance to economic or ornamental plants.

LITERATURE CITED

ALDRICH, J. M.

1925. New Diptera or two-winged flies in the United States National Museum. Proc. U. S. Natl. Mus. 66(18):1-36 (see pp. 8-9).

DYAR, H. G.

1920. A new noctuid from Oregon. (Lepidoptera, Noctuidae, Acronyctinae). Insecutor Inscitiae Menstruus. 8(7-9):146.

HEINRICH, CARL

1923. Revision of the North American moths of the Subfamily Eucosminae of the Family Olethreutidae. U. S. Natl. Mus. Bul. 123, pp. 255-256.

MELANDER, A. L.

1920. Synopsis of the dipterous family Psilidae. Psyche 27(5): 89-101 (see p. 99).

PIPER, CHARLES V. AND R. K. BEATTIE

1915. Flora of the Northwest Coast, p. 215.

THE FEMALE OF PSEUDOMETHOCA ANTHRACINA (FOX) (Hymenoptera: Mutillidae)

Evidence has been obtained to substantiate Mickel's contention¹ that *Pseudomethoca harpalyce* (Fox)² is the female of *P. anthracina* (Fox)³. An analysis of the distributional patterns of the California *Pseudomethoca* fauna has revealed that those of *anthracina* and *harpalyce* are virtually superimposable. In the fall of 1947 at Antioch, California, a freshly emerged female (*harpalyce*) was caged and within a short time a male (*anthracina*) was actively attempting to enter the cage. On September 8, 1948, at the same locality, the sexes in question were observed and taken in copulo. In view of the above evidence, *Mutilla* [= *Pseudomethoca*] *harpalyce* Fox is regarded as a synonym of *Sphaerophthalma* [= *Pseudomethoca*] *anthracina* Fox.—PAUL D. HURD, JR.

¹Proc. U. S. Nat. Museum, 1924, vol. 64, p. 21.

²Trans. Amer. Ent. Soc., 1899, vol. 25, p. 227.

³Ent. News, 1892, vol. 3, p. 172.

NEW SPECIES OF ORIENTAL ENDOMYCHIDAE, WITH
REMARKS ON SOME PREVIOUSLY KNOWN SPECIES

(Coleoptera: Endomychidae)

H. F. STROHECKER

University of Miami, Florida

Through the kindness of E. C. Van Dyke and H. B. Leech I have recently been able to study many specimens of Endomychidae in the collection of the California Academy of Sciences. Most of these are from the Orient; of unusual interest are examples collected in Formosa, Hainan and southern China, many of them from the J. L. Gressitt collection.

MYCETINA MARGINALIS (Gebler)

Lycoperdina marginalis Gebler, 1830, Cat. Coleopt. Siberiae Occid. Th. 2.

Mycetina obliquesignata Gorham, 1873, Endomycici Recitati, p. 44.

Engonius konumaensis Ohta, 1931, Jour. Faculty Agric. Sapporo, 30, p. 220.

Phaeomychus konumaensis Chujo, 1938, Trans. Nat. Hist. Soc. Formosa, 28, p. 394.

Ohta (1931:220) did not properly recognize the genus *Engonius*; the three species referred to it by him belong to other genera. As Chujo has pointed out (1938:398), *Engonius taitoensis* and *E. baibaranus* of Ohta are the two sexes of *Eumorphus quadriguttatus formosanus* Pic, which occurs also on Hainan. *E. konumaensis* Ohta was referred to *Phaeomychus* by Chujo (1938:394), a justified move. But the generic name *Phaeomychus* Gorham is not available here since its type, *Endomychus rufipennis* Motschulsky, is a species of *Mycetina*. In 1830 Gebler described *Lycoperdina marginalis* from Siberia and the species has not been recognized since. In my collection there are four specimens labeled "Sutschan, Ussuri", and I have seen one other from Transbaikal. It seems certain that the above synonymy is applicable.

ENGONIUS MUSHANUS (Ohta)

In the California Academy collection is a specimen taken at Wong Sa Shui, S. Kiangsi, S. China, by J. L. Gressitt, which agrees exactly with Ohta's description and figure of *Brachytrycherus*

mushanus. The specimen is, however, an *Engonius*. On the basis of Ohta's diagnosis I had already placed *mushanus* under *Engonius* in

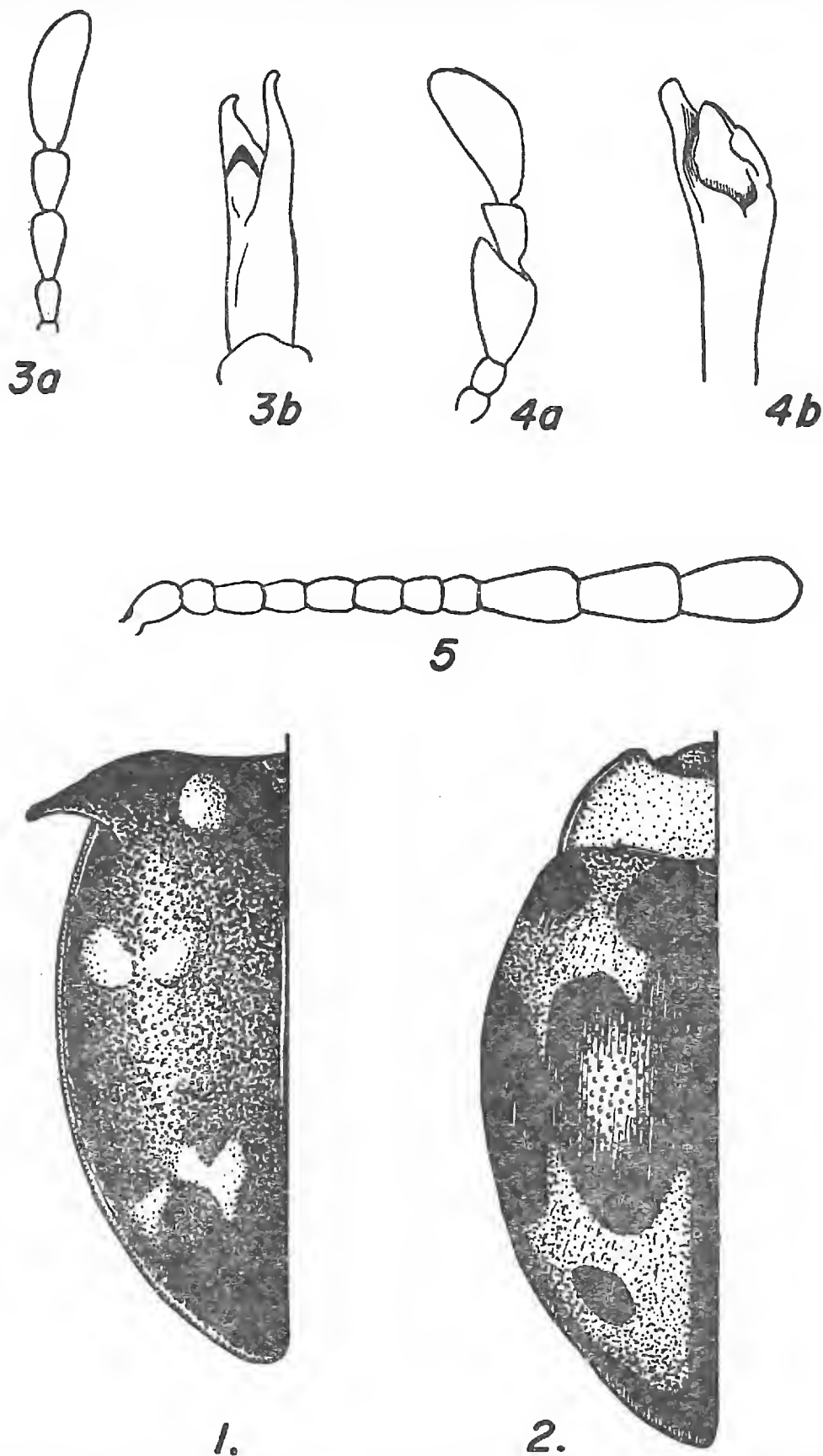


Fig. 1. *Amphisternus astarte*, elytron. Fig. 2. *Meilichius erotylodes*. Fig. 3a. *Saula longior*, club of antenna. Fig. 3b. *S. longior*, aedeagus. Fig. 4a. *Danae chinensis*, club of antenna. Fig. 4b. *D. chinensis*, aedeagus. Fig. 5. *Meilichius pachycerus*, antenna.

my private catalogue and this seems vindicated. The subgeneric name *Ohtaius* Chujo falls as a synonym of *Engonius*.

PARINDALMUS TONKINEUS Achard

Three other specimens of unusual interest to me were collected at Tai Au Hong, S. Kiangsi, S. China, by Gressitt. They agree perfectly with Achard's description (1922:29) of *Parindalmus tonkineus*. Arrow (1928:351) expressed the opinion that Achard's *Parindalmus* was the same as *Pedanus* Gerstaecker, and the three specimens now at hand corroborate his judgment. However, since Schoenherr used the generic name *Pedanus* in the Curculionidae in 1823 it appears that *Parindalmus* Achard must be used for the species formerly referred to *Pedanus* Gerstaecker.

Amphisternus astarte Strohecker, new species

Black, the elytra with subcupreous reflections and each with a broad, recurved humeral spine and five reddish-yellow callosities. Of these the most anterior is rounded and near the scutellum; the next two are subtriangular in outline and are situated in a transverse line before the middle; the remaining two callosities occupy a transverse line on the last third of the elytron. Length 10 mm.

Head coarsely and thickly punctured, with an impression near each antennal base. Antennae slender, third segment almost as long as fourth and fifth combined; club moderately broad, compact, strongly flattened. Pronotum transverse, its front angles much thickened, extended beyond the eyes and acutely rounded; hind angles slightly acute, hardly produced. Disc of pronotum finely, sparsely punctured, with a feeble median longitudinal groove and two shallow impressions on each side. Basal foveae short and deep, basal transverse sulcus deep. Elytra as described above, rather coarsely and closely punctured at base, more finely toward apex. Prosternum broad, its intercoxal process deeply forked. Mesosternum strongly transverse. Abdominal sternites coarsely and thickly punctured except the smooth posterior edge of each. Femora clavate, tibiae simple.

Holotype: Female, BUKAI, FORMOSA, VI-14-32, L. Gressitt (Calif. Acad. Sciences).

The holotype is the only specimen I have seen. This is a very distinctive species, distinguishable from all others described by its recurved humeral spines with absence of other elytral spines or verruculae.

Ancylopus concolor Strohecker, new species

Head, legs and antennae black, pronotum, elytra and undersurface reddish-brown, the sides of metasternum and abdomen infuscate. Length 6.5 mm.

The head is coarsely and closely punctured, eyes prominent and coarsely granulate. Antennae with third segment almost twice length of fourth; club loose-jointed, narrow, not much flattened. Pronotum transverse, broadest at mid-length, slightly narrowed to the produced and acutely rounded front angles and to the hind angles, which are approximately right-angled. Lateral sulci linear, not reaching to middle of disc; basal transverse sulcus deep, extended laterally to hind angles. Disc sparsely punctate, with several large, punctiform foveae on each side of middle. Elytra coarsely and rather closely punctured. Prosternum short and very narrow, the front coxae contiguous. Mesosternum narrow, middle coxae approximate. Fifth abdominal sternite broadly rounded at apex and minutely v-excised at middle of hind margin. Front tibia incurved and enlarged at apex, with row of minute tubercles on inner face. Middle tibia incurved and enlarged near apex. Hind tibia straight, somewhat enlarged at tip and with a dense brush of setae at its inner apical angle.

The structure of the tibiae and fifth abdominal sternite suggest that the specimen is a male. Dissection failed, however, to yield an aedeagus. Possibly this organ was extruded, and was broken off after drying.

Holotype: Sex? TAI AU HONG, S. KIANGSI, S. CHINA, VII-7-36, J. L. Gressitt (Calif. Acad. Sciences).

Apparently the only names hitherto correctly referable to *Ancylopus* are *melanocephalus* Olivier and its synonyms and color varieties. The other species placed by their describers in *Ancylopus* are better relegated to *Indalmus* on the basis of mesosternal structure. In *Ancylopus* the mesosternum is strongly narrowed between the middle coxae, while in *Indalmus* it is about parallel. *Ancylopus melanocephalus* has the elytra extensively marked with black; in the male the front tibia is strongly toothed; in the female the pronotum has an arcuate, transverse groove at mid-length.

Mycetina minor Strohecker, new species

A small species of the *brevicollis* group but recognizable by its somewhat elongate, subparallel form. Entirely castaneous except the antennae and eyes, strongly shining. Antennae stout, segment 2 very small and globose, 3 a little longer than broad, 4 and 5 about quadrate, the remainder transverse. The antenna has no distinct club but is gradually broadened from the third segment outward. Segments 1 and 11 clear ferruginous, 2 to 5 dusky, 6 to 10 black. Length 3.2 mm.

Pronotum brilliant, its disc not perceptibly punctured. Basal foveae narrowly triangular, prolonged to middle of disc. Basal

transverse sulcus broadly excavated, leaving a basal marginal area of considerable width. Elytra at base subequal in width to pronotum, their umbones moderately prominent and concolorous with the disc. From their base the elytra are slightly widened to about their mid-length, thence gradually narrowed and evenly rounded at tip. Disc of elytra finely, sparsely punctured, the punctures thicker near the suture. Represented only by the holotype.

Holotype: Sex? TONDANO, N. CELEBES, IV-1-32, van Braekel (Calif. Acad. Sciences).

The most closely related species are *M. brevicollis* Gorham and *M. globosa* Arrow of Borneo. Both these species have the elytra short and subglobose, with the umbones very prominent and of yellow color.

Encymon valgus Strohecker, new species

Head and pronotum dark red, almost black, shining. Elytra long-oval, deep indigo in color, moderately convex (for the genus), a little flattened above and with moderately broad side margins. Length 7 mm.

Since the species of *Encymon* are so similar in their general structure it seems futile to do more than note the features, particularly those of the male, characteristic of the present species. In its overall appearance this insect resembles *E. immaculatus* (Montruzier) but the front angles of the pronotum are less produced and the elytra less convex and more broadly margined than in *immaculatus*. In the holotype male of *valgus* the front tibia is simple, the middle tibia strongly incurved near its apex and with a row of small tubercles on its inner face, the hind tibia undulate. *Encymon violaceus* Gerstaecker shows similar tibial modifications but is easily identified by its finely muricate, opaque pronotum and highly convex elytra.

Holotype: Male. BALBALAN, LUZON, PHILIPPINE ISLANDS (author's collection).

Allotype: Female. Data as for type and wholly similar in appearance except the tibiae are all simple. Three additional females appear to belong to this species and are designated paratypes. One is labeled "Montalban, Luzon", another "Subuagrn, Luzon" and the third "Philippinen, Luzon".

Encymon truncaticollis Strohecker, new species

Head and pronotum red, elytra deep violet, oval and moderately convex, a little flattened above and with the sutural border depressed. Pronotum with front angles very short and obtusely rounded. Length 7 mm.

Head between the eyes with two rounded impressions. Pronotum distinctive, its front angles much rounded and not produced, its anterior margin strongly sinuate. Hind angles right. Disc of pronotum abruptly convex toward middle and with a fovea on each side in front of middle; lateral sulci long, linear; basal transverse sulcus deep. Elytra as described, their side margins moderately broad. Front tibia simple, middle tibia a little incurved toward tip, hind tibia weakly undulate.

Holotype: Male. MT. MAKILING, LAGUNA, PHILIPPINE ISLANDS, XI-1-32, F. C. Hadden (Calif. Acad. Sciences).

A single female specimen collected by Hadden on Mt. Makiling (VI-29-31) may be of this species but the pronotum has the front angles decidedly acute although little produced, and the hind angles are acute. The disc of the pronotum is evenly and slightly convex as is usual in the genus. The elytra conform closely to the description given for the holotype. An imperfect male specimen in my collection from Balbalan, Luzon, Philippine Islands, is designated a paratype.

ENCYMON VIOLACEUS CUPREATUS Mader

In my collection are four specimens from the type locality, Banguay Island. These specimens came from the Staudinger collection and are undoubtedly part of the original material from which came the type series of Mader. I feel confident in saying that *cupreatus* Mader is merely the teneral phase of *violaceus* Gerst.

Danae chinensis Strohecker, new species

Very similar to *Danae denticornis* (Gorham) but notably larger. Head, antennae, pronotum, legs and under surface of prothorax black; elytra and abdominal sternites ferruginous. Entirely clothed with a fine, fairly dense, recumbent pubescence. Length 4.25 mm.

Head deeply sunken in the prothorax, the eyes partly hidden. Antennae with segment 9 much thicker and broader than 10 or 11 and internally acute at apex; segment 10 small, its outline almost a right triangle; 11 somewhat reniform, twice as long as broad. Pronotum broadest before middle, abruptly rounded to the very obtuse front angles, narrowing posteriorly but expanding slightly to the feebly acute hind angles. Basal foveae short, deep and oblique; basal transverse sulcus fine and shallow. Elytra long-oval and subparallel. The tibiae are all straight and otherwise unmodified.

Holotype: Male. HONG SAN, S. E. KIANGSI, CHINA, L. Gressitt (Calif. Acad. Sciences). Another male with the same data as that of the holotype is designated a paratype and is in the author's collection.

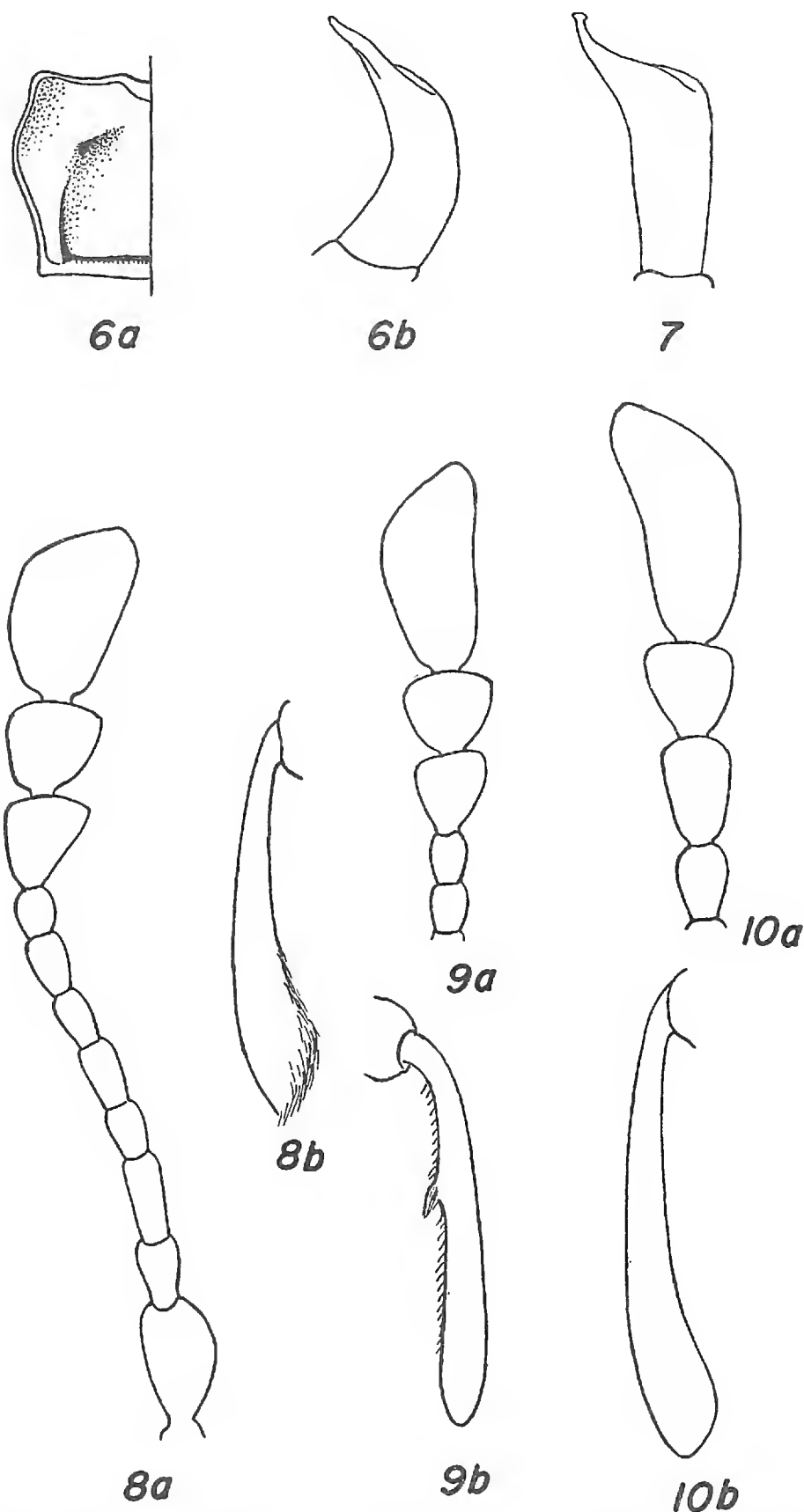


Fig. 6a. *Encymon truncaticollis*, pronotum. Fig. 6b. *E. truncaticollis*, aedeagus. Fig. 7. *Encymon valgus*, aedeagus. Fig. 8a. *Saula luzonica*, antenna. Fig. 8b. *S. luzonica*, front tibia of male. Fig. 9a. *Saula dentipes*, club of antenna. Fig. 9b. *S. dentipes*, front tibia of male. Fig. 10a. *Saula longiclava*, club of antenna. Fig. 10b. *S. longiclava*, front tibia of male.

The male of this species may be distinguished from the same sex of *denticornis* by the absence of an internal tooth on the ninth antennal segment. Identification of females may be more difficult. I have associated no females with the males described. The Academy collection contains two males of *denticornis* from Hainan and four females from Kwantung and Fukien Provinces, which I have also referred to *denticornis*.

Saula longior Strohecker, new species

Among the known species of *Saula* the present one is unusual in its elongate form and long antennae, in which features it resembles *S. filicornis* Arrow of the Philippines. Even the aedeagi of the two species do not offer differences of major order. The legs in *longior* are of the same tawny color as the rest of the insect while in *filicornis* the legs are usually mostly black. I have, however, specimens of *filicornis* from Mindoro and Masbate which have the legs entirely tawny. Perhaps the best feature separating the two species is the shape of the last antennal segment. In *filicornis* it is somewhat less than twice as long as broad and subtruncate at apex, thus presenting a narrowly triangular outline. In *longior* it is twice or more as long as broad and the apex is rounded. Other male features in which the two species resemble each other are the slightly curved front tibia and the roundly excised fifth and sixth abdominal sternites. The sixth sternite is greatly reflexed on each side, embracing the pygidium, which is vertical. While the males of some other species of *Saula* have the pygidium so exposed none of those described show the great degree of reflexion of the sixth seen in *longior* and *filicornis*. Length 4 mm.

Holotype: Male. MOTHRONWALA, DEHRA DUN, U. P. [INDIA], IX-16-32, B.D. Saklani (Calif. Acad. Sciences).

Saula dentipes Strohecker, new species

Small, with the pronotum and elytra more convex than is usual in the genus. Ferruginous except the eyes, distal seven or eight antennal segments, tibiae and extremities of femora, which are black. Clothed with a sparse, tawny, semi-erect pubescence. Length 3 mm.

Antennae stout but fairly long; segment 2 a little longer than broad; 3 slender; 2 to 7 subequal in length but increasing in breadth from 4 outward; 8 a little shorter than 7 and subglobose; 9 and 10 very similar in size and shape, each about as broad as long; 11 widely blade-shaped, equal in length to 9 and 10 combined. Pronotum a little more than half again as broad as long, front angles short and obtuse, hind angles right. Sides of pronotum parallel behind, widest

in front of middle. Elytra notably broader at base than pronotum, a little widened to about mid-length, thence tapering and somewhat attenuate behind; umbones not prominent.

Front trochanters subtriangularly elevated; front tibia with a small tubercle on its inner face before mid-length. The tubercle bears a dense tuft of hairs, appearing as an acute tooth. The type is unique.

Holotype: Male. CABUGAO, N. LUZON, PHILLIPINE ISLANDS (author's coll.).

Saula luzonica Strohecker, new species

Very similar to the preceding species in form and coloration but distinguishable on the basis of antennal structure and tibial characters of the male.

Antennae with segment 1 massive, a little longer than broad; 2 much thinner than 1, a little longer than broad; 3 equal in breadth to 2 but longer; 4 and 6 subequal to segment 2 in breadth and length; 5 and 7 each equal in length to 6 but distinctly broader; 8 subglobose; 9 as broad as long; 10 approximately equal to 9; 11 ovoid, broader than 10 and about as long as 9 and 10 together. Front tibia incurved and enlarged at apex; front trochanters normal; middle tibia feebly curved; hind tibia straight.

Holotype: Male. MANILA, PHILIPPINES (author's coll.). *Allotype*: Female. Manila, Luzon, P. I. (author's coll.). Differs from the holotype only in the tibiae, which are all straight and otherwise unmodified.

The following specimens are designated *paratypes*: Four males and two females from Manila; one male and one female from Cabugao, Luzon; one male and one female from Los Banos, Luzon; one female from Montalban, Luzon; one female from Mt. Makiling. A male from Polillo and a female from Mt. Banahao, Luzon, are very similar but seem to present some small structural differences.

Saula longiclava Strohecker, new species

A small insect generally similar in appearance to the two preceding but more highly convex and with the umbones of elytra more prominent. Dark red-brown, shining, clothed with a sparse pubescence. Tibiae black. Length 3.5 mm.

The stalk segments of the antennae resemble those of the two preceding species but the club presents adequate differences for identification. The first club segment is considerably longer than broad; the second is about equal in length to the first but broader; the last is elongate-oval, longer than the first two combined. The front tibia is flattened on its inner face at middle, beyond this point gradually incurved.

Holotype: Male. DAPA, SURIGAO, PHILIPPINE ISLANDS. (author's coll.). *Allotype*: Female; data as for type.

The above description applies to the allotype except that its front tibia is straight. I have seen no other material.

Meilichius pachycerus Strohecker, new species

Short-oval in outline, highly convex; ferruginous with metallic sheen, lateral areas of pronotum and elytral umbones yellowish, meso- and metasterna infusate. Antennae stout, segments 1 to 5 ferruginous, 6 infusate at apex, 7 to 10 black, 11 black with its apical half yellow. Length 3.8 mm.

Antennae stout, about half as long as the body, gradually increasing in thickness from base to apex; segments 3 to 6 a little longer than broad; 7 and 8 quadrate; 9 to 11 each considerably longer than broad, their combined length equal to that of the preceding seven together. Pronotum with its front angles produced and acute, its sides lightly curved and gradually divergent to the approximately right hind angles, its posterior margin feebly tri-sinuate. Basal foveae minute, shallow, triangular; transverse sulcus represented by a fine groove on each side of base. Disc of pronotum finely and sparsely punctured. Elytra normally convex for the genus, its umbones rather prominent, its disc coarsely and sparsely punctured.

Holotype: Sex? Mjöberg Coll., no locality label but very probably Borneo (Calif. Acad. Sciences).

Three other specimens with identical data are designated paratypes. A damaged specimen labeled Kalabit Co., Borneo (Mjöberg Collection, Calif. Acad. Sciences) has also been studied.

Most closely related to the Bornean species *M. brevicollis* and *apicornis* Arrow, but differs notably in the stout structure of the antennae.

Meilichius erotyloides Strohecker, new species

A bizarre form which looks at first glance like an erotyloid but its structure is definitely endomychid. It might be referred to *Bolbomorphus* but the mesosternum is almost linearly transverse as in *Meilichius*.

Head and antennae black, the latter short and stout with segment 3 a little longer than broad, 2 and 4 to 6 quadrate, 7 and 8 transverse; club abruptly formed, its first segment about as long as broad, its second transverse, and the last very little longer than broad with its apex oblique. Pronotum deep red, its surface almost flat, irregularly punctured and with a small smooth spot on each side at base; front angles short and acute; front margin arcuately excised for reception of the head; hind angles slightly acute; basal

foveae minute. Elytra long oval, somewhat produced and sub-acuminate at apex, sparsely punctured; black, each with two large yellow marks, anterior of these encloses the humerus, leaving a circular area on the umbone black; inner margin tri-dentate. The posterior yellow marking is pre-apical and it conforms in shape to the elytron, tapering apically. In its center is a rounded black spot and it emits two rays from its anterior margin. The prosternum is very broad, deeply but not thickly punctured. Mesosternum very short, almost linearly transverse. Metasternum coarsely and sparsely punctured. Legs short and stout. Length 4.5 mm.

Holotype: Sex? TA HAN, HAINAN, VI-24-35, L. Gressitt (Calif. Acad. Sciences).

REFERENCES CITED

- ACHARD, J.
1922. Description de nouveaux Endomychides. *Fragments Entomologiques*, pp. 28-30.
- ARROW, G. J.
1928. Coléoptères Érotylides et endomychides de L'Indochine Française. *Faune des Colonies Françaises*, 2:329-357.
- CHUJO, M.
1938. Some additions and revisions to the Japanese Endomychidae. *Trans. Nat. Hist. Soc. Formosa*, 28:394-406.
- GEBLER, F.
1830. (as quoted in Gerstaecker, 1858, p. 219)
- GERSTAECKER, A.
1858. *Entomographien I. Monographie der Endomychiden*. Wilhelm Engelmann, Leipzig. xiv+433 pp., 3 pls.
- MADER, L.
1936. Neue Coleopteren und Notizen. *Entom. Rundschau*, 54:63.
- OHTA, Y.
1931. Beitrag zur Kenntniss der Endomychiden Japans. *Jour. Faculty Agric. Sapporo, Hokkaido Imp. Univ.*, 30:205-242.

NESTING HABITS OF STENIOLIA NIGRIPES PARKER

(Hymenoptera: Sphecidae)

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In the late forenoon of April 25, 1949, the author found a colony of the bembicine wasp, *Steniolia nigripes* Parker, nesting in a small rocky valley at Yaqui Well, Borego Desert, San Diego County,

California. Since there are no published accounts of the nesting habits or prey utilized by this or any other species of *Steniolia*, observations which were made at the time may prove of interest.

The nesting site was a level patch of bare soil among the rocks of the side and approximately ten feet above the floor of the narrow valley. The soil was compact but somewhat friable, composed of a coarse, granitic sand with a powdery base. When the site was first located four female wasps were actively digging. Males were seen to visit the area occasionally, but no matings were observed. A bombyliid fly, *Lepidanthrax* sp.¹ was flying about six inches behind one of the females as she returned to her nest, and alighted on the ground about four inches from the nest entrance when the wasp entered. The wasp was making frequent short flights between periods of digging, and so persistent was the fly in following that she was easily captured in an insect net, along with the wasp, by swinging at the wasp in flight. The wasp was released and returned in five minutes or so, approaching her nest several times before finally entering and resuming excavation.

Nest openings, perhaps made in large part by emerging wasps, were scattered over a circular area some seven or eight feet in diameter. Toward the center, an area nineteen inches wide by twenty-nine inches long was excavated to a depth of not less than eighteen inches. Forty-one empty cocoons and one containing a live wasp were removed. The average depth of the cocoons was 3½ inches, with a range between 2½ and 4½ inches. Entrance tunnels were typically short and unbranched, slanting directly to the level of the cocoon, then turned to the horizontal and almost immediately expanded into an oval cell. There was also a tendency for them to deviate around rocks, and to join or ramify, possibly caused by an annual accumulation of tunnels and cells. Three cocoons were found together in an enlarged chamber beneath a buried rock, and may have been from the same or from different years.

A single bombyliid, *Aphoebantus ?hirsutus* Coq. was encountered during excavation, and had probably been stored as prey, since two others, *Aphoebantus hirsutus* Coq. and *Aphoebantus* sp., near *tardus* Coq. were taken from wasps which returned after excavation of the site had begun.

¹All Diptera kindly determined by Dr. F. R. Cole.

A NEW SPECIES OF *HAPLAXIUS*, WITH A KEY TO CALIFORNIA SPECIES

(Homoptera: Cixiidae)

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The genus *Haplaxius* was erected by Fowler (1904) for two Mexican species. Later, Caldwell (1946) pointed out that this name should also be applied to the species which had been included in the genus *Myndus* Stål in American literature. Caldwell includes 28 species in the genus, two of which were described from California. A third California species is described in this paper. It is one of the most distinctively marked species of the genus.

Haplaxius gabrielensis Flock, new species

Similar to *mojavensis* (Ball), but with basal and subbasal bands on the elytra, and lateral margins of frons more broadly expanded.

Female: Vertex slender, narrower at apex than at base. Frons 2.6 times as wide at apex as at base (0.19 : 0.50 mm.), wider than long (0.62 : 0.59 mm.), with a slight median carina. Pronotum two-thirds as long as eyes, and deeply, angularly emarginate posteriorly. Elytral nervures heavily setigerous; the cubitus forking far back, forming a cell only twice as long as broad; stigma cell almost semicircular.

Color, dark above and paler below. Vertex dark. Frons brownish with indication of black inside the base of the lateral carinae. Clypeus with disc brown, darker on sides. Pronotum pale with dark-brown areas behind the eyes. Mesonotum pale posteriorly, with a small dark area outside the carinae, and a large dark area on anterior half between the carinae. Elytra light, with basal dark band extending to apex of mesonotum, subapical dark band within basal third of elytra, apical third dark except for five transparent areas extending basally along some of the veins; part of apical veins white. Length, 4.12 mm.

Male: Dark areas considerably reduced, both in size and in intensity. Pygopher longer than wide, posterior ventral margin excavated in middle, with a short, broad, median process having a triangular apex reaching to the broadened apical portion of the style. Anal segment short, broad; ventral side concave, forming a hood over the genital capsule; telson dorsal. Styles boot-shaped, inner angle rounded, outer angle and apex truncate. Aedeagus in ventral view

with one large apical spine and a small subapical spine curving towards the anterior, and one smaller subapical spine curving in a posterior direction; in lateral view with large, erect ventral spine extending in an anterior direction. Length, 4.0 mm.

Holotype female, *allotype* male, and 14 *paratypes* taken from Our Lord's Candle (*Yucca whipplei* Torr.), SAN GABRIEL MTS., CALIFORNIA, at 4500 feet, July 10, 1950 (R. A. Flock). Types in author's collection. Paratypes to be placed in the collections of the University of California at Berkeley and at Riverside, in the United States National Museum, and in the Snow Collection at the University of Kansas.

HAPLAXIUS MOJAVENSIS (Ball)

Myndus mojavensis Ball, 1933 Jour. Wash. Acad. Sci. 23:480.

The types were collected at Mojave, California, on Joshua tree (*Yucca brevifolia* Engelm.) by E. D. Ball. I have since taken it in the San Jacinto Mts., California, Sept. 29, 1948, on *Agave deserti* Engelm. The specimens were compared with the type by David A. Young of the Division of Insect Identification, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture.

HAPLAXIUS OCCIDENTALIS (Van Duzee)

Myndus occidentalis Van Duzee, 1914, Trans. San Diego Soc. Nat. Hist. 2:39.

This species appears to be fairly widespread in southern California. It is usually found in damp places in washes, on grasses and sedges. Several of the specimens were also taken on *Baccharis viminea* DC. The type locality is Lakeside, California, May, 1913; Van Duzee, collector. It has been taken on a sticky board hung in a citrus tree April 25 to May 9, 1947 (R. C. Dickson), during an investigation of possible vectors of "quick decline", a virus disease of citrus.

Key to Reported California Species

- A. Elytra with definite markings between the veins.
 - B. Elytra with markings at apex.....*mojavensis*
 - BB. Elytra with basal and subbasal dark bands
 - and apical markings.....*gabrielensis*
- AA. Elytra without definite markings between the veins.....
 -*occidentalis*

LITERATURE CITED

FOWLER, W. W.

1904. *Biologia Centrali-Americana*. Hemiptera-Homoptera.
1:97-8, pl. 10.

CALDWELL, J. S.

1946. Notes on *Haplaxius* Fowler with descriptions of new species. *Proc. Ent. Soc. Wash.* 48:203-6, 1 pl.

NOTE ON THE SWARMING OF BRACHYMYRMEX SP.

(Hymenoptera: Formicidae)

On the evening of August 15, 1950, between 6:35 and 7:05 p.m. (Pacific daylight saving time), above the lawn on the south edge of the State Capitol Grounds at Sacramento, California, the writers observed large swarms of *Brachymyrmex* sp.¹ A swarm containing several thousands of the small males was first observed while looking into the direction of the sun. The central mass of the swarm was about four feet in diameter and occupied a space from about three to eight feet above the ground. Small masses of males would at times increase the speed of their frenzied dance and would form small cylinders of blurred wings and bodies which would move up and away from the larger body and after a few seconds return to the slower moving swarm. After the discovery of the first swarm an examination of the place revealed that over an area of lawn of at least 100 by 100 feet there were four additional swarms of males in flight in addition to numerous flying individuals filling the entire area. One of these swarms reached a height of approximately fifteen feet. Occasionally smaller numbers of the ants would form several small cylinders as noted above. Some males and females were noted crawling about in the grass. A few females were seen flying about and were not intimately associated with the main swarms of males. A section of shaded lawn separated from the above mentioned area by a row of trees also contained at least one large swarm which was more difficult to see because of the lack of sun due to surrounding trees. Still another swarm of *Brachymyrmex* was observed at the opposite north end of the grounds. In an adjoining fountain many hundreds of fallen specimens were observed on the surface of the water where they could not escape. Meteorological conditions: still air, bright sunlight, temperature 97 degrees F.

—P. H. ARNAUD and L. W. QUATE.

¹Determined by M. R. Smith, U. S. National Museum.

ANOPHELES FREEBORNI HIBERNATING IN
WOOD RATS' NESTS (Diptera: Culicidae)

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While collecting *Triatoma* from the nests of *Neotoma fuscipes* Baird on November 27, 1950, at Redlands, California, several anophelines were observed flying from the food and dung chambers of a wood rat's nest. Five specimens of some 20 mosquitoes were collected. On examination they were found to be four females and one male of *Anopheles freeborni* Aitken; two of the females had recently obtained a blood meal. Several of the mosquitoes which were disturbed on opening the nest made definite directional flights back into the remaining portions of the nest. One may conclude from their desire to re-enter the nest that this is a preferred habitat and not one accidentally discovered by them.

On February 5, 1951, three wood rats' nests were opened in the San Timoteo Canyon, 11 miles southeast of Redlands, California. The nests were located 150 yards from suitable anopheline breeding grounds and 300 yards from the nearest cattle.

The following data were obtained from these three nests.

Nest No. 1. Twelve females of *Anopheles freeborni* present.

Nest size: 6 feet in diameter at base and 5 feet high.

Nest No. 2. Nine females of *A. freeborni*.

Nest size: 4 feet in diameter at base and 3 feet high.

Nest No. 3. Ten females of *A. freeborni*.

Nest size: 6 feet in diameter at base and 4½ feet high.

Many of the mosquitoes were in the central portion of the brushpile-like nest, being surrounded by as much as two feet of nesting material. Seventy-one per cent of the mosquitoes had plump abdomens and 29 per cent were rather slender. None of the mosquitoes had obtained a fresh blood meal for at least several days. Seriological examination is contemplated if mosquitoes are found with recent blood meals, to determine whether the hibernating females may have fed on the wood rats in the interior chambers of the nest.

These findings show that this ecological niche should be considered when endeavoring to reduce the population of overwintering anopheline females.

NEW NEVADA ORTHOPTERA RECORDS FOR
THE 1949 COLLECTING SEASON

IRA LA RIVERS

University of Nevada, Reno

TETTIGONIIDAE

Tettigoniinae

ZACYCLOPTERA ATRIPENNIS CAUDELL, 1907

In the 42 years since the discovery of this species, sporadically intensive collecting has failed to extend its range beyond that of the type locality, the southern end of Walker Lake, Mineral County, Nevada. Although I have never quite believed the species could be so restricted, particularly in light of the fact that many Nevada valleys are practically carbon copies of Walker Valley, several attempts on my part to detect it beyond the confines of the valley were failures.

It might be supposed that the large Walker Lake, occupying most of Walker Valley, had something to do with creating a habitat somehow different from that of other valleys lacking bodies of water, but even a casual collecting acquaintance with *Z. atripennis* and its habits plainly showed the lake to be as non-functional as a habitat factor as if it did not exist. The large insect is a distinct arenophile, inhabiting sand dunes and sanded areas, and the plants it has been recorded from are pronounced eremophiles and widely recorded far from the vicinity of water. These plants grow practically to the rapidly receding shoreline of brackish Walker Lake, and when this 30 by 5 mile lake (175 feet deep) has completely disappeared, as it will within the lifespan of many who read this, these same eremophilous plants will grow the entire length and breadth of the valley, unless an alkaline playa occupies the flat valley floor.

However, the actual discovery of the species outside the type locality was a considerable and unexpected surprise—expecting to find it south, east or north of Walker Valley, seemingly the best possibilities in the order named, I found it two valleys to the west!

Lyon County: *Smith Valley* (highway 3 miles east of Central), 18, 21 & 23:vii:49, elev. 4,850 ft.—La Rivers

All specimens were taken at night, three males and two females being found on the highway, and two ovipositing females in the brush some 100 yards from the highway. This locality is some 40 airline miles west-northwest of the south end of Walker Lake, and separated from it by two mountain ranges and their intervening valleys. The same plants are present although the elevation is higher. The area in which the *Zacycloptera* were found is dominated by the little greasewood, *Sarcobatus baileyi*, with an abundance of saltbrush (*Atriplex confertifolia*), Indian tea (*Ephedra nevadensis*) and sand bunchgrass (*Oryzopsis hymenoides*). Along the sandy road shoulders, an occasional scrawny *Dalea polyadenia*, characteristic indicator of sand dunes and their environs, showed the effects of car movement on desert shrubs. With some slight change in percentiles, the general botanic picture was characteristically that of the animal's type locality. And the first specimens were taken only accidentally—while collecting for the much more common *Plagiostira gillettei*, which see.

In habits, *Zacycloptera* is more prone to bite than the equally large *Plagiostira*, which latter is relatively mild-tempered for such a husky, well-mandibled insect. The larger, black wings of *Zacycloptera*, spread down along the abdominal sides when disturbed, give the animal a more pugnacious aspect than its companion species.

In addition to its vegetarian habits, *Zacycloptera*, like most of its group, is avidly scavengerous when the opportunity presents itself. The first specimen taken, a female, was feeding on a car-crushed *Plagiostira*. While this is a common trait in tettigoniids, it is not at all remarkable, since such pronounced vegetarians as *Eleodes* (Coleoptera: Tenebrionidae) will feed readily on car-crushed insects.

On July 22, two ovipositing females were found during the course of night collecting, both in the *Sarcobatetum baileyi* some 100 yards north of the highway, only one of which was collected. This specimen kept its ovipositor in the ground for 20 minutes after being found in spite of the bright Coleman lamp, then pulled her ovipositor from the ground and hurried off—into my cyanide bottle. Sieving the spot produced seven grayish-white eggs identical, as nearly as the eye can tell, to the eggs of *Plagiostira gillettei*, and much like those of *Anabrus simplex*. A rather cold wind was blowing gently, and a temperature reading at the oviposition site gave 69° F.

Mineral County: *Yerington-Schurz highway* (1 mile east of

Mineral-Lyon County line), 23:vii:49, elev. 5,500 ft—La Rivers; *Thorne Dunes*, 23:vii:49, elev. 4,600 ft—La Rivers.

The Yerington-Schurz highway record is that of a car-crushed specimen and constitutes the northernmost record for the species, the locale being some 38 airline miles northwest of the type locality and 25 airline miles northeast of the Smith Valley locality (33 airline miles due north of type locality baseline, and 17 airline miles due north of the Smith Valley locality baseline). Like the Smith Valley specimens, it was found at night.

The species seems to wander about on the ground only during the cooler hours after dark; the three males and one female found at the Thorne Dunes were all taken between sundown and deep dusk, and in bushes, principally *Dalea polyadenia*. Unlike those at Smith Valley, none were found wandering the ground after dark, and so the hoped-for oviposition data was not forthcoming here. I was not able to induce any of the males to sing.

CAPNOBOTES OCCIDENTALIS (THOMAS), 1872

A specimen of this small-bodied, large-winged species, common over large parts of Nevada, was found at the Smith Valley Zacycloptera locale feeding on a car-crushed *Plagiostira gillettei*. Omnivorous, it is agile enough to catch other insects in full vigor (La Rivers, 1948) and is equally a vegetarian and a carnivore.

PLAGIOSTIRA GILLETTEI CAUDELL, 1907

This large and extremely handsome insect was also found in Smith Valley for the first time, and much more commonly than at any previous Nevada locality. Once considered rare, even after being recorded from two localities in west-central Nevada (La Rivers, 1948), its appearance in what can only be described as comparatively fantastic numbers at certain spots this season makes past use of the word "rare" almost meaningless.

Lyon County: *Smith Valley* (1)—Artesia Dunes, 20:vii:49, elev. 4,800 ft.—La Rivers; (2)—highway 3 miles east of Central, 15, 18, 21, 22:vii:49, elev. 4,850 ft.—La Rivers; (3)— $\frac{1}{2}$ mile south of Hudson (Helé), 23:vii:49, elev. 4,800 ft.—La Rivers; (4)—Three Forks (3 miles north of Central), 9, 14, 16, 18:vii:49, elev. 4,800 ft.—La Rivers.

The species was first taken at the Three Forks locality, which is a small sanded area just north of the West Walker River, dominated by the arenophilous *Tetradymia comosa*, a large, strikingly pleasant bush with whitish stems and leaves and bright yellow flowers; where I have seen it in Nevada, this plant is an indicator of sanded

areas. Its principal companion plant here was the nearly equally large shadscale, *Atriplex canescens*.

Mid-day collecting at Three Forks almost immediately disclosed the presence of *Plagiostira*, and in considerable numbers, several in each bush. They were invariably hanging quietly, head up or down, and some feeding took place during this hot noon period.

The animal is slow and clumsy and easy to catch. Few showed any signs of alarm even when approached as close as three feet, and when they did decide to move, they wandered slowly and reluctantly downward along a stem. If the source of the disturbance passed on, or moved away a distance, they returned to inactivity or feeding. If an unsuccessful pass was made at an individual, it usually sufficiently excited the animal to cause it to drop, sometimes aided by a weak push from the hind legs, into the center of the bush. Few made this descent in less than several stages, but the brittle dead stems and dense living stems of the large bush were usually sufficient to save them from further persecution.

These specimens were a little more pugnacious than I had remembered them from previous Nevada collecting, and I soon found that catching them between two handkerchiefs was easier on the fingers, both from the standpoint of the occasional sharp twig encountered, and their formidable jaws, and the chance of missing the specimen was also considerably lessened. As with practically all insects which bite at all, these would bite anything within reach—one excited female swallowed the tarsi and half of the tibia of one of her middle legs, which were extracted whole only with considerable difficulty.

While most specimens here were taken from the numerous *Tetradymia comosa*, they were also common in the tops of the large and green shadscale. Typically, the heat at this part of the day registered 100° F. Night collecting at Three Forks showed that practically all specimens left the bushes and wandered about extensively on the ground during these cooler hours. Although night temperatures were pleasantly warm, *Plagiostirae* were lethargic, and even constant nudging failed to elicit more than a reluctant hop, seemingly more in indignation than fear. Such habits lead to speculations as to what protection the species has for perpetuation. Although undoubtedly possessed of parasites, none were found during the several weeks observance of the species in Smith Valley. Principal associates in this night wandering were the large tenebrionids *Eleodes obscura sulcipennis* and *E. armata*, the former predominant.

The discovery of *Plagiostirae* on the highway east of Central was accidental, and several nights collecting produced several quarts of specimens. The center of population for this particular area seemed to begin some three miles east of Central and extend the mile-and-a-half from there to the west portal of Wilson Cañon. At about the middle of this area, the topography breaks from a low central bench down to lower, rolling land toward Wilson Cañon, and the eastern edge of the bench yielded the greatest number of specimens. In this same general area, hordes of *Celerio lineata* (Lepidoptera: Sphingidae) caterpillars were marching about during the day, stripping first any and all Onagraceae to be found, then feeding on other vegetation. Unlike the Three Forks locality, this area was dominated by *Sarcobatus baileyi* and *Atriplex confertifolia* (see *Zacycloptera atripennis*) and was quite different in facies.

About a third of the highway *Plagiostirae* were taken while feeding on their car-crushed brethren, and it was found that any highway-killed animal was acceptable food—specimens were seen feeding on the remains of *Eleodes hispilabris imitabilis* (tenebrionid), *Zacycloptera atripennis*, an unidentified myrmeleonid, the large scorpion *Hadrurus hirsutus* and the remains of the common blacktailed jackrabbit, *Lepus californicus*. One lone female was noted trying to insert her long, decurved ovipositor into the asphalt. While all specimens try to bite when picked up, none make the vigorous body contortions of such as *Capnobotes* in attempts to “mandibulate” the captor. The defensive display made by spreading the intensely black hind wings down along the abdominal sides is a conspicuous element of their “fight” reaction, and many of the males sang weakly and intermittently when handled.

At this locality, *Hadrurus hirsutus* was found feeding on a non-crushed male *Plagiostira*, which it had evidently caught while prowling the highway. In addition, crushed specimens were food for *Eleodes hispilabris imitabilis*, an unidentified myrmeleonid, *Zacycloptera atripennis*, *Capnobotes occidentalis* and the gryllacridid *Stenopelmatus fuscus*.

The lone ovipositing *Plagiostira* was taken in rather rocky ground a few yards south of the highway.

At the Artesia Dunes, in northeastern Smith Valley, the species was commonly found day and night. These dunes are stationary, with a good growth of *Dalea polyadenia*, *Ephedra nevadensis*, *Atriplex canescens* and *Tetradymia comosa* and are low, long, generally north-south ridges apparently blown eastward from the shores of

the large alkaline playa, Artesia Lake, which occupies a considerable portion of the north end of Smith Valley. Unlike Three Forks, where the species was not found in vegetation during nighttime, or the Central Highway, where no specimens could be found during daytime, at Artesia Dunes they were found both in vegetation and on the ground during twilight and after dark. Two specimens *in copulo* were noted in a large Russian thistle (*Salsola kali tenuifolia*), while two additional females were found with the newly attached seminal sac still protruding unassimilated from the abdominal terminus. As many as 15 specimens were found in one medium-sized Dalea bush.

The Hudson locality was much like that at Three Forks, being on the south side of the West Walker River, with the same species of plants.

Churchill County: *Fossil Hills*, 20 mi. WSW of Fallon, 31:vii:49, elev. 4,500 ft—La Rivers; 1 mi. E. of *Mahala Sloughs*, 14:vii:49, elev. 4,000 ft.

The Mahala Sloughs specimens were collected by Miss Laura E. Mills and Mrs. J. S. Mills of Fallon, and from information obtained from Miss Mills later, it seems that the species was commoner on the highway here (U. S. 50) than in Smith Valley. The dominant plant in this region of white alkali is the large greasewood, *Sarcobatus vermiculatus*, on which the Mills saw *Plagiostirae* feeding. On the highway with the larger insect was the much smaller gryllacridid *Ammobaenetes lariversi*, which is known to be quite common locally on sand dunes.

At the Fossil Hills locality, several specimens were found in hot mid-afternoon in large Russian thistles growing on a series of small dunes composed of fine, very white sand. These dunes lay in a south-facing pocket in the southwest corner of the small range, at a considerable elevation above the Lahontan Valley floor, and the dominant bush was Russian thistle. This record, with Mahala Sloughs, delineates the known northwestern limits of the species' range in this part of Nevada.

In the following list of host plants, those newly added by this season's collecting are marked with an asterisk:

**Artemisia tridentata*, *Atriplex canescens*, *A. confertifolia*, **Dalea polyandenia*, **Ephedra nevadensis*, *Oryzopsis hymenoides*, *Salsola kali tenuifolia*, **Sarcobatus baileyi*, **S. vermiculatus* and **Tetradymia comosa*.

ANOPILODUSA ARIZONENSIS (REHN), 1904

Churchill County: 6 mi. E. of *Stillwater*, 9:viii;49, elev. 4,000 ft.—La Rivers.

The discovery of this very rare insect as far north as west-central Nevada was the crowning surprise of the collecting season. Previously known only from Arizona and extreme southern Nevada, its rarity has made it an object of intense search in the past (Tinkham, 1942). The comments of Rehn and Hebard (1909) concerning the single specimen they caught on the Nevada side of the Nevada-California state line could be applied with hardly a change in wording to the solitary Stillwater specimen. Both localities are foothill slopes of volcanic hills, and both specimens were flushed from bushes, "greasewood" in the case of southern Nevada, saltbrush (*Atriplex confertifolia*) at Stillwater. The species' former distribution seemed to indicate it was restricted to creosote areas (*Larrea divaricata*); the Stillwater discovery, approximately 300 airline miles northwesterly of its southern Nevada locality, adds the extensive shadscale area to the species' life zone. Stillwater is some 150 airline miles northwesterly from the northwestern limit of creosote in Nevada's Sonoran Trailway (for a brief resumé of this Trailway, see La Rivers, 1948:654).

My attention was attracted to the female specimen by the activities of a small Western collared lizard (*Crotaphytus collaris baileyi*) hunting near the top of a saltbrush (*Atriplex confertifolia*). As I watched, the lizard flushed a large yellowish orthopteran which flew strongly to another bush about 100 feet away, where it was caught. Two days and one night were spent combing a vicinity of about a square mile for other specimens, without success. The two dominant plants of the gradual slope are the mentioned *Sarcobatus baileyi* and *Atriplex confertifolia*. The slope itself is composed of soft alkaline dust—Pleistocene Lake Lahontan sediments—covered with the typical desert pavement of volcanic stones and pebbles.

The specimen was not quite so prone to bite as is the similarly-built *Capnobotes occidentalis*.

It seems expedient, at this point, to mention an additional specimen for California. Tinkham (1942) recorded a badly disintegrated individual from Yermo in southern California, in the collection of the state quarantine station there. I recently noticed a fine female specimen in the collection of the Division of Entomology and Parasitology of the University of California at Berkeley with

the following data: San Bernardino County: *Yermo Quarantine Station*, 3:vii:49, elev. 1,935 ft.—Warren Leigh. It was taken in early evening, presumably at light.

GRYLLACRIDIDAE

STENOPELMATUS FUSCUS HALDEMAN, 1852

Lander County: 8 mi. E. of *Austin*, on U. S. 50, 2:ix:49, elev. 5,500 ft.—La Rivers and T. J. Trelease; Lyon County: *Smith Valley*—(1)—Artesia Dunes, 20:vii:49, elev. 4,800 ft.—La Rivers—(2)—highway 3 mi. E. of Central, 18:vii:49, elev. 4,850 ft.—La Rivers.

The above records add two more counties to those already listed for the State (La Rivers, 1948). The animal certainly occurs in every county of the State. All specimens were found wandering after dark, the Lyon County individual feeding on a car-crushed *Plagiostira*.

LITERATURE CITED

LA RIVERS, IRA.

1948. A synopsis of Nevada Orthoptera. *Amer. Midl. Nat.*, 39 (3) : 652-720.

REHN, J. A. G., and M. HEBARD

1909. An orthopterological reconnaissance of the southwestern U. S. III. California and Nevada. *Proc. Acad. Nat. Sci. Phila.*, 61:409-483.

TINKHAM, E. R.

1942. The re-discovery of *Anoplodusa arizonensis*. *Bull. Chicago Acad. Sci.*, 6 (12) :221-227.

BOOK NOTICE

INSECTS IN YOUR LIFE. By C. H. Curran. Sheridan House, Inc., New York, 316 pp., illustrated. 1951. Price \$3.50.

As the title suggests, insects cannot be entirely divorced from the human race. They have been associated with man ever since he first laid aside a few acorns, a bit of smoked meat and a supply of hides to cover his back. Good or bad, they are reluctant to be disassociated from either animal or plant life. Dr. Curran has written a graphic and excellent account of some of the closer contacts we have with insects. To fully appreciate his viewpoint, the reader must cast away all hearsay prejudices and assume an attitude of confidence in words of a well educated and experienced entomologist. It must be borne in mind, too, that these few examples are only fragments of what may be written on behalf of or against these tiny creatures that have had some two hundred million years more experience on this earth than we humans.

Because of the great abundance of insects everywhere indoors and out, people, young and old, should become acquainted with their looks and ways. And this book offers the chance to get started. Its pages are full of charm and wisdom—charm that causes one delight in understanding the ways of dragonflies and butterflies and the wisdom needed to recognize and to know how to control clothes moths, termites, bot flies and numerous other insect pests. "Ticks are a Menace to Animal Life"; "Butterflies are Big Game"; "The Yucca Moth the World's First Horticulturist" writes Dr. Curran. And if you are not too squeamish, be sure to read the chapter, "On Eating Insects" so that you may continue the daily consumption of insects with much more understanding and relish; and who knows, perhaps insects contain more food vitamins than a doctor's prescription.

Insects furnish one of the most marvelous examples of the purpose and spontaneity of life and without insects and flowers this would be a dull world.

Dr. Curran has also written an important systematic work on "North American Diptera" and another popular book: "Insects of the Pacific World." I recommend most highly all of these.

—E. O. ESSIG

THE MODIFIED HIND WING OF EUGLOSSA

(Hymenoptera: Apoidea)

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The hind wing of the aculeate Hymenoptera characteristically has two lobes on the posterior margin: the vannal lobe, limited exteriorly by the vannal (= preaxillary) incision, which usually coincides with the end of the vannal vein, and the more proximal jugal (= anal) lobe, limited by the jugal (= axillary) incision, which is usually in line with a more or less chitinized fold near the base of the wing. One or another (rarely both) of these lobes is frequently secondarily absent. Thus, the jugal lobe is absent in the more advanced mutillids, all but the most primitive ants, and certain vespid and sphecoid wasps, as set forth in Bradley's well-known key to the families of the Clistogastra, in Comstock's "An Introduction to Entomology." In the Apoidea, the jugal lobe is absent in *Bombus*, and in the Euglossini. The tribe Euglossini

comprises five genera, both pollen-collecting and parasitic forms, which are limited to the New World, and are mainly tropical.

Although the jugal lobe is missing in *Euglossa*, the space which should be occupied by the lobe is in part filled by a brush formed by a dozen or so strong bristles arising from a basal thickening of the vannal vein. These bristles lie in a single row, but some of the bristles are bent, so that the surface formed is curved. I have seen no reference to any such structure in the Hymenoptera, and term

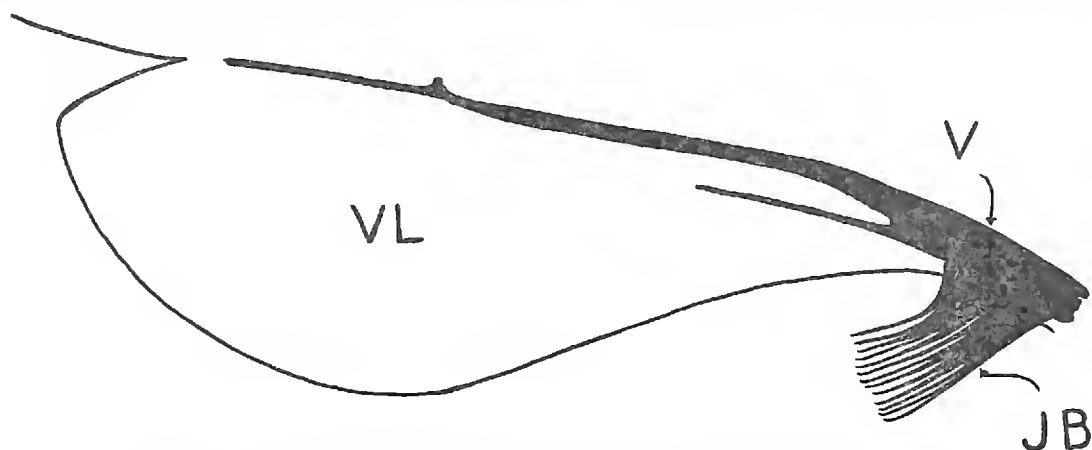


Fig. 1. Portion of base of hind wing of *Euglossa*.
JB, jugal brush; V, vannal vein; VL, vannal lobe.

it the *jugal brush*. In at least some species of *Euglossa*, the brush is fairly large and conspicuous, and one could imagine that it might serve the same function as the jugal lobe. However, in *Eulaema* and *Exaerete* the brush is quite small in relation to the area of the wing. Although the jugal brush might be analogous to the jugal lobe, it is certainly not homologous to it, since the bristles are not formed by a breakup of the wing membrane. The presence of a basal lobe on the trailing edge of the flight surface is quite characteristic of the more powerfully flying groups of Diptera and Hymenoptera, and presumably is of some aerodynamic significance.

Morphologically, the Euglossini are among the most remarkable of bees, Michener (1944, Comparative external morphology, phylogeny, and a classification of the bees (Hymenoptera). Bul. Amer. Mus. Nat. Hist. 82:290) describes the unique tentorium of *Euglossa*. In addition, the extensive velvety area (possibly sensory or scent-dispersing) on the anterior surface of the middle tibia in males, and the partially or almost entirely enclosed pubescent area on the hind tibia of the males are not, to my knowledge, known outside the tribe.

I am indebted to Dr. T. H. Hubbell for the use of specimens in the collection of the University of Michigan Museum.

SOME NEW WORLD XYLOTINAE

(Diptera: Syrphidae)

F. M. HULL

University of Mississippi

Several interesting species of Syrphid flies belonging to the subfamily Xylotinae have recently been discovered among miscellaneous material. These flies are here described. The genus *Crepidomyia* is neotropical; heretofore only four species have been known.

Crepidomyia dion Hull, new species

Related to *C. darlingtoni* Hull. There is no spur on the hind tibiae. The wings are quite dark, but the general color is blue-black. There are no yellow spots upon the second abdominal segment. Length 13.5 mm.

Female. *Head*: the face, cheeks, front, vertex and occiput are black. There is a narrow band of white pubescence along the sides of the face adjacent to the lateral carina. The lateral and medial carina are quite sharp. There is a transverse band of whitish pollen across the middle of the front expanded somewhat near the eye margins; this band when viewed anteriorly becomes pale brown in front of the ocelli. The immediate rim of the preantennal callus and the inner portion of the antennal pits are light yellowish-brown. The antennae are black, the arista missing; antennal pile black. The pile of the upper front is black; across the middle front it is whitish and the few hairs of the face are white. The occipital pollen is greyish-white; the pile is whitish becoming black dorsally. *Thorax*: the mesonotum is quite dull black, a little more shining upon the postcalli, the area in front of the calli and upon the scutellum. There are only very faint traces of pollinose vittae submedially and sublaterally upon the mesonotum, but there is a prominent yellowish white triangle of pollen medial to and adjacent to the humerus; it becomes evanescent after curving around behind the humerus. The transverse suture is conspicuously margined with pollen of the same color which reaches only to the notopleura. The mesonotum, including the scutellum, is densely covered with appressed black setae and has scattered longer black hairs. The scutellar fringe is quite copious and white. The pleura are shining black with thinly dusted whitish pollen and only scattered white hairs. The squamae are greyish-white basally but widely blackish-sepia along the margin and fringe. Halteres reddish-orange. *Legs*: entirely black except the hind basitarsi which are perhaps dark reddish to orange-brown and pale yellow pilose.

The hind femora are moderately thickened in the middle with heavy spines throughout their length. The hind trochanters have a short, sharp, black spur apically. The hind tibiae end without spur. *Wings*: deeply sepia-brown beginning at the base of the submarginal cell, becoming paler on the discal cell and at the apex of the wing. The pterostigma is still more blackish except towards the apex where it too becomes pale. The small cross vein is slightly recurrent apically, pulled out apically and hence oblique, and joins the discal cell beyond the middle. The third vein is gently curved backward. The marginal cell is opened as wide as its apical width; the whole basal portion of the wing is pale brown with slight yellowish cast with the exception of the basal portion of the marginal cell and extreme base of the basal cells which are almost hyaline. The wings have a distinct purplish reflection, greatest when viewed from the ventral surface and greater from the blackish areas. *Abdomen*: slightly widest upon the third segment which has approximately parallel sides; the fourth segment is a little narrowed. The fifth segment is creased upon the outer third near the middle creating the impression of two segments. The entire abdomen is dully shining black and slightly greasy. The pile is short, appressed, black, but yellow laterally on the sides of the first and second segments, in the middle posteriorly on the fourth segment and upon all of the fifth segment.

Holotype: female, CHANCHAMAYO, PERU, Jan. 3, 1949. J. Schunke. Type in author's collection.

Crepidomyia cybele Hull, new species

Distinct in the stripes of golden appressed pile on the mesonotum and the light brownish-orange face. Not closely related to other species. Length 12.5 mm.

Female. *Head*: the face is light brownish-orange with dense golden pubescence reaching almost to the blunt medial carina and the blunt lateral carina. The cheeks are brassy black; the front is black and quite brassy in reflection with an obscure band of golden-brown pollen across the middle of the front and pale yellow pile which is more or less concentrated in an oval patch along the eye margin on each side of this band. Just before the narrow pre-antennal callus there is a transverse depression. The vertex is shining black, greenish to brassy in reflection with seven black hairs behind and perhaps as many in front. The first segment of the antennae is blackish, the second is dark brown, the third missing; the facial pile is yellow and the occiput brassy black, yellowish pollinose with pale brassy pile throughout. *Thorax*: the mesonotum is black with a broad, medial, posteriorly furcate, faint, reddish sepia pollinose vitta and still more faint similar ones sublaterally; the lateral margins throughout and the medial vitta, at least upon the

anterior half is densely appressed, greenish brassy pilose; the pleural and scutellar pile is of the same color; the reflection of the scutellum is brassy, its apex with deeply crimped margin and copious, conspicuous, brassy ventral fringe. Squamae and fringe and halteres pale orange. The anterior and middle legs, except for coxae and trochanters, are entirely bright clear egg-yellow with similarly colored pile. The hind femora are yellowish-brown basally, becoming reddish through the middle, still darker at the apices, their pile golden except apically, their ventral margins with nine stout, sharp, black, spinous setae. The hind tibiae are nearly blackish but actually dark reddish-sepia, especially ventrally and basally; their pile is black, except for a short streak of golden hair baso-laterally and medio-apically. The hind tibiae have two stout, bidentate, short, spinous processes, deep cleft between. Hind tarsi yellowish-brown, most of their dorsal pile golden. *Wings*: almost uniformly tinged with pale yellowish-brown; the costal cell and the first basal cell are light yellow; the pterostigma is deep yellow except apically; the marginal cell is opened as wide as its apical width; the third vein is more gently concave than in *dion* n. sp; the small cross vein is more oblique, not recurrent, entering the discal cell barely beyond the middle. *Abdomen*: black, but shining brassy to purplish on the first segment and the sides of the second, third and fourth segments. These latter segments are broadly opaque black down the middle and the opaque color is expanded posteriorly to include most of the posterior margin and anteriorly expanded only upon the second and fourth segments. Pile upon the brassy areas and sides long, erect and pale yellow. Upon the black areas short, black and quite appressed.

Holotype: female, CHANCHAMAYO, PERU, Jan. 20, 1949, J. Schunke. Type in author's collection.

Neplas sapphirina Hull, new species

Related to *bidens* Curran. The third abdominal segment is wholly shining green without opaque areas or subbasal reddish-brown bands. The second segment has a strong bluish cast especially anteriorly and laterally. Hind femora strongly bluish basally, greenish apically. Length 10.7 mm.

Male. *Head*: face black except above the epistoma where it is pale yellow. The cheeks are black; the front is brassy black and bare upon a broad rectangle lying upon the lower half of the front. The upper half of the front is linearly notched antero-medially and the sides of the front and the whole of the face are pale yellowish-white pubescent. The frontal and facial pile is yellowish-white; the face has a sharp medial carina. The first two segments of the antennae are nearly black; the third is elongate, twice as long as its basal width; it is a little more narrow on the apical half and black with the base dull reddish, the pile white. The vertex is dully shining black with the area across the front of the ocelli opaque blackish and the

anterior half of the vertical triangle yellowish white pollinose and yellow pilose. All vertical pile and all occipital pile pale; the upper occipital hairs are more deeply yellow or reddish-yellow. The eyes touch for about ten facets; the anterior facets are considerably enlarged. *Thorax*: the mesonotum is black, rather shining, with three faint, coppery vittae, the region between is faintly greenish; the post calli and the scutellum have bluish reflections; the mesonotal pile is short, erect and black with vittae of pale brassy pile. There is a pair of wide, widely separated, brassy stripes which begin anteriorly but become quite slender at the base of the scutellum; they merge into a transverse, wide band of similarly colored pile in front of the scutellum. There is a narrow medial vitta, a sutural marginal vitta and a sublateral stripe running from the suture back to the scutellum, all of pale yellow pile. The pile in front of the suture is thinly yellowish and there is a conspicuous, yellowish-white patch of pollen bordering the humerus medially. The scutellar pile is abundant and pale yellow. The pleura are bluish black with nearly white pile. The white squamae have a blackish sepia border and fringe. Halteres yellowish. *Legs*: the anterior and middle femora are quite black; their apices are narrowly brownish-yellow. Hind femora are immensely thickened, shining black with bluish reflections, very dark reddish-brown at the apex, with five apico-lateral, sharp, black spines ventrally. The pile of the femora for the most part is nearly white. The anterior and middle tibiae are black but light yellow diffusely on the basal fourth or less. The first two segments of anterior and middle tarsi are yellowish white; remaining segments black. Hind tibiae black, the base narrowly whitish, the dorsal pile whitish, the ventral pile short and black. These tibiae are quite concave with knife-edge both basally and apically; the ventral spur is quite long and flattened, rounded and pale at the apex. The hind tarsi are black on the last four segments, sepia on the basal one, the dorsal pile pale. *Wings*: greyish hyaline, the pterostigma dark brown. *Abdomen*: slightly narrowed at the end of the second segment. The second segment is long; it is one and three-fifths longer than its posterior width and distinctly emarginate and except at the apex, with a deep shining blue reflection. Viewed from the rear this segment is dully opaque through the middle and more widely at base and at apex. The first segment is black, dully shining, transversely striate with faint bluish reflections. The second segment is also markedly striate. Third segment and the fourth entirely shining greenish brassy in color. The pile is yellowish white basally becoming black along the posterior margin except at the sides. All of the pile of the fourth segment is brassy-yellow. The fourth sternite is crimped into a thin median ridge. Pile of first and second segments whitish along the sides.

Holotype: male, CHANCHAMAYO, PERU, August 1, 1948, J. Schunke. *Paratypes*: two males, same data. Types in author's collection.

A SATISFACTORY TECHNIQUE FOR
REARING AGROMYZID FLIES FROM THE
LEAF MINING LARVAL STAGE¹

(Diptera: Agromyzidae)

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Rearing adults from mined leaves containing larvae is the most desirable method of collecting these small flies. Host records, mined leaves, larvae, and puparia, as well as the adults, are all valuable as aids in separating the many closely related species found in a number of genera, particularly *Liriomyza* Mik and *Phytomyza* Fallén.

The literature concerning the rearing of agromyzids is scant. Inchbald (1881) found the adults not difficult to rear, "if the collector will only imitate Nature in her ways and means." He found that an occasional light sprinkling of water was needed to supply moisture normally provided by rain or dew. Frost (1924) placed the mined leaves individually into small, round, seamless tin boxes or in tissue paper triangles as the mined leaves were collected in the field. The paper triangles were kept in a tin box. Upon returning to the laboratory, all larvae that had emerged and pupated were placed individually in small, one-dram vials, corked to prevent evaporation. With those species which pupated in the mines, a small section of leaf containing the pupa was cut out and placed in a stoppered vial.

In spite of the relatively dry climatic conditions occurring in California, lack of humidity was found to be the limiting factor when rearing the various species in the laboratory. None of the larvae of the numerous species reared by the writer was known to leave a desiccated leaf, crawl to another, and begin a new mine. Therefore, it was necessary to devise a method to keep the leaves fresh for a period of four or five days until the larvae had emerged or pupated at the end of the mine.

¹Published as Scientific Paper No. 915, Washington Agricultural Experiment Stations, Institute of Agricultural Sciences, The State College of Washington, Pullman.

Leaves containing mines of a particular species were gathered with petioles as long as possible. The collected leaves were segregated as to mine type, and kept in paper bags containing a damp paper towel and held shut by paper clips. Mines of all ages were included. Those from which the larvae had emerged were pressed in a standard plant press. The smaller, newer mines, although more difficult to detect, were preferred because parasitism by braconid and chalcidoid parasites became a crucial factor in rearing flies from mature larvae. Freshly externally parasitized larvae, *i. e.*, those that were motionless, but not discolored, made satisfactory specimens for preserving in alcohol.

Upon returning to the laboratory, the writer separated the leaves which were to be kept fresh from the others. The petioles were clipped back one-eighth to one-fourth of an inch from the original breaking point and the leaves immediately placed in water. The petioles of two to six leaves, depending upon the size, were then rolled together in wet cotton strips making a firm plug that could be forced into the top of a vial of water (fig. 1). To prevent the emerging larvae from falling to the water around the cotton plug and drowning, the vials were inverted.

Each vial was supported by a piece of wire—straightened paper clips proved convenient—having one end clamped around the neck of the vial. When the cotton plugs were fitted firmly, no leakage of water occurred. Each vial or series of vials holding leaves mined by the same species was then placed in a wide mouthed one-half pint or one pint jar. The lids of the jars previously had been cut out near the rim and covered with a fine mesh cloth. The vials were removed immediately after all larvae had emerged. The leaves frequently made satisfactory herbarium specimens. An inverted vial of water plugged with cotton was usually placed in the jars to increase humidity.

Some adults failed to emerge, particularly of those species whose larvae mine the leaves of plants associated with damp situations. As a result, it was found necessary to add about half an inch of fine, washed sand to the bottom of each jar. The sand was kept moist by adding water as needed, until all adults had emerged.

For economy of space, the pupae of each species passing through a winter diapause were placed in a small numbered vial covered with a fine mesh cloth held in place by a rubber band. As many

vials as possible were then placed upright in the jars, and the bottom of each jar was kept covered with about half an inch of water. With the cloth lids on the jars, the humidity remained sufficiently high to prevent pupal desiccation.

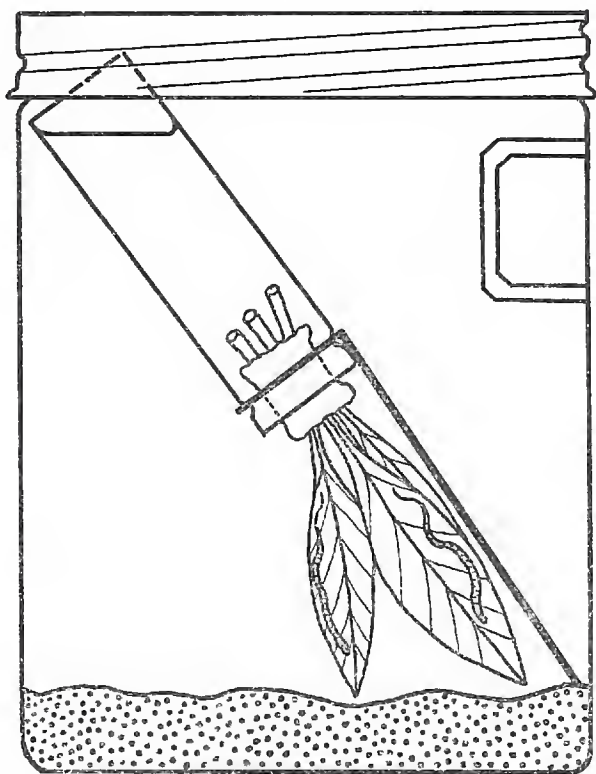


Fig. 1. Diagram of a rearing jar. The inverted vial within is supported by a piece of wire. Damp sand covers the bottom of the jar.

When a great number of leaves mined by a single species were encountered, as was often the case when agricultural crops were attacked, a high percentage of adult emergence was obtained simply by filling jars of suitable size (gallon jars often being required) with the mined leaves. The humidity created by the decomposing vegetation was sufficient to keep the leaves fresh until the larvae had emerged and pupated. Care was taken, however, to keep any liquid in which the pupae might have drowned, from collecting on the bottoms of the jars.

LITERATURE CITED

FROST, S. W.

1924. A study of the leaf-mining Diptera of North America. Cornell Agric. Expt. Sta. Mem., 78:6-7.

INCHBALD, P.

1881. Remarks on our dipterous plant-miners, and the plants they affect. *The Entomologist*, 14:41.

A METHOD FOR TAKING APHIDS IN FLIGHT

F. C. HOTTES

Grand Junction, Colorado

It has long been the practice for entomologists to make aphid flight studies by the use of "sticky traps". This requires the removal of the aphids from the adhesive material, a process which, as those of us that are called upon to make the determinations know all too well, often results in irreparable damage to the specimens. I have had no practical experience with aphid traps, nor have I been able to check the literature; however, I have long had the idea that a more effective method of making aphid flight studies would be welcomed by economic entomologists.

Last fall a chance observation of many aphids resting on a turkish towel hanging on a clothes line rekindled this thought. The towel was a deep yellow and by chance was hanging next to a pale blue one, which in turn was followed by white ones. The blue towel and the white ones had hardly any aphids on them, in sharp contrast to the yellow which had many. Experiments to determine if aphids had a color preference for yellow were set up, and carried through the month of October and into November, thus covering the height of the fall aphid migration. It was determined that at no time was the yellow towel less than three times as effective as the blue in attracting aphids, and often ten times. The blue towel was about twice as effective as the white, in fact the aphids on the white towels were so few that perhaps they landed there by chance. A typical count for a given twenty-minute period was 72 for the yellow, 8 for the blue and 2 for the white.

The aphids seemed reluctant to take flight from the surface of the towels and walked with difficulty over their shaggy surface. This indicates that once caught they were at least temporarily trapped. Specimens could be picked off readily without damaging them. Only once were specimens mounted for study; they belonged to the following genera: *Aphis*, *Macrosiphum*, *Amphorophora*, *Pemphigus* and *Prociphilus*.

Considering that Turkish towels have two effective surfaces, have considerable area, that aphids seem reluctant to take flight from their surface, and that aphids apparently show a color preference, towels appear to warrant further investigation as aphid traps.

REARING THE GREENBOTTLE FLY ON DOG BISCUITS

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The greenbottle fly, *Phaenicia sericata* (Meigen), was successfully raised on dog biscuits in the laboratory, following the method described by Frings (1947, 1948), with a few modifications. "Milk Bone Small Size Dog Biscuits," manufactured by the National Biscuit Company, was the brand used. The small size dog biscuits gave better results than the "Milk Bone Tiny Bits," as there was less packing of the medium. The addition of powdered milk as a source of protein for the adults to feed on increased egg production, and the flies started oviposition sooner than when fed only on moist dog biscuits.

The laboratory colony was started by caging wild flies and feeding them on powdered milk and moist dog biscuits. Three and one-half dog biscuits were placed in a 50 ml. beaker filled with water, and left in the cage for 24 hours for the flies to oviposit on. The mass of eggs and dog biscuits was then placed on top of the prepared larval food.

To prepare food for the larvae, dog biscuits were placed in a gallon jar to a depth of two inches, covered with water and allowed to stand until soaked through; then the water was poured off. The biscuits were soft to the touch throughout when ready; the time it took for the water to soak through the dog biscuits varied from one batch to another. Fine wire screen was used to confine the maggots to the jars. If the population of maggots was too high for the available food, additional moist dog biscuits were added at the rate of two inches at a time.

The maggots fed for six to seven days at 80 degrees F. Coarse sawdust was added on top of the mixture for the maggots to pupate in. After pupation the sawdust containing the puparia was poured out and placed in cages for emergence.

Very little odor was noticed during the rearing of the flies. After the maggots left the media to pupate, decomposition odors were noticed but these were held back by the sawdust.

¹Published with the approval of the Director of the Idaho Agricultural Experiment Station as Research Paper No. 324.

LITERATURE CITED

FRINGS, H.

1947. A simple method for rearing blowflies without meat. *Science*, 105 (273) : 482.

FRINGS, H.

1948. Rearing houseflies and blowflies on dog biscuit. *Science*, 107 (2789) : 629-630.

A NOTE ON THE MANNER OF FEEDING OF
AGULLA ADNIXA HAGEN

(Raphidiodea: Raphidiidae)

J. W. TILDEN

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In feeding, this species devours aphids entirely, swallowing all parts and rejecting nothing. The prey is masticated rapidly and then swallowed with a gulping motion. An adult female, placed in a vial containing a twig with fifty-seven aphids, began at the bottom of the colony and ate it entirely in less than nine minutes.

Feeding is systematic and rapid. The head is passed among the foliage and surfaces palpated with both pairs of palpi. Sight appears to play but little part in the location of prey. Upon touching an aphid, the head is then withdrawn and the long pronotum arched back, and the head then darts forward with great speed, in a snake-like movement that is nearly too fast to follow. The prey is grasped by the mandibles and the head is raised slightly and withdrawn. The mandibles work rapidly and rhythmically while the palpi, for the most part, are not applied to the victim once it is captured, but are vibrated rapidly.

The gular sutures are very flexible and may be seen to give to some extent as swallowing takes place. After the colony was eaten, a second inspection of the twig took place, very carefully done, to be sure that no further prey remained. Subsequently, an extended period of grooming and adjustment of appendages followed, including raising, lowering and extension of the wings, without any attempt to fly. A period of apparent torpidity then ensued, and no further activities followed during the remainder of the day.

Next morning the raphidid appeared to be as hungry as before, and repeated the entire process in a similar manner with another aphid colony. This behavior indicates a very effective predator.

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THE PAN-PACIFIC ENTOMOLOGIST

Published by the
Pacific Coast Entomological Society
in cooperation of
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VOLUME TWENTY-SEVEN

1951

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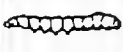
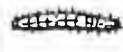
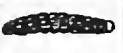
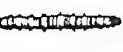
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ALDRIN and/or DIELDRIN are available for experimental use in the following forms:

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- 100% ALDRIN (Crystalline)
- 60% Equivalent Solution
- 25% Emulsifiable Concentrate (2 lbs. actual ALDRIN per gallon)
- 25% Wettable Powder
- 50% Wettable Powder (suggested for use in seed treatment and in soil pest control)
- 2½% Dust

DIELDRIN

- 100% DIELDRIN (Crystalline)
- 18½% Emulsifiable Concentrate (1½ lbs. actual DIELDRIN per gallon)
- 25% Wettable Powder
- 50% Wettable Powder (suggested for use in seed treatment and in soil pest control)
- 2½% Dust

Your correspondence is invited concerning formulations and field applications of ALDRIN and DIELDRIN. Entomological Reports on ALDRIN and DIELDRIN may be obtained upon request.

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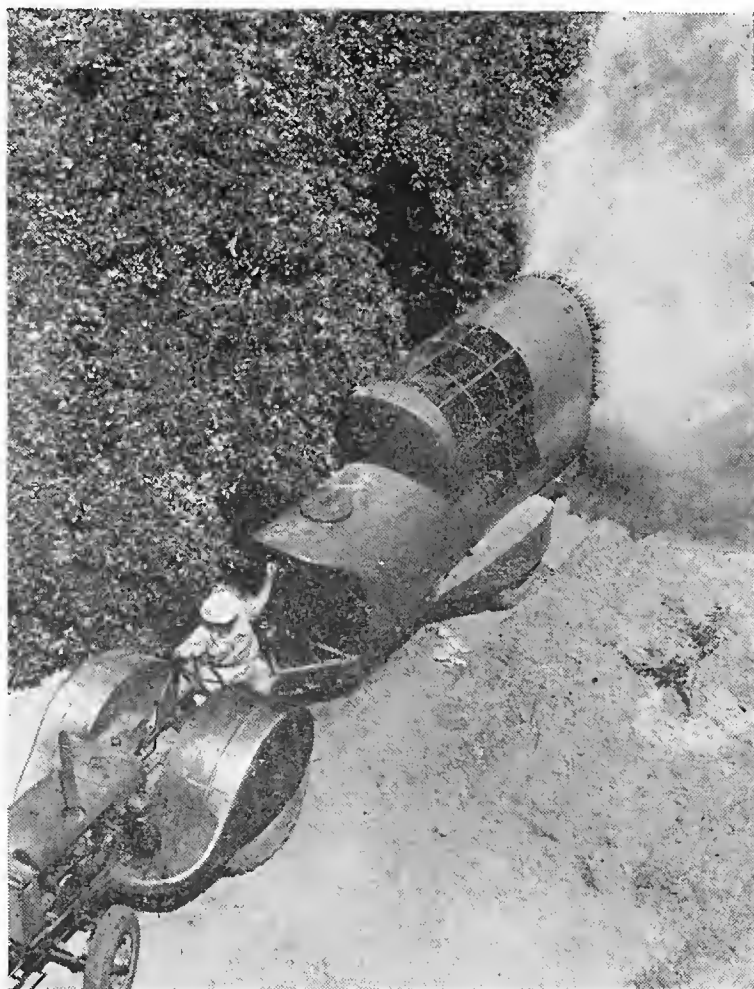
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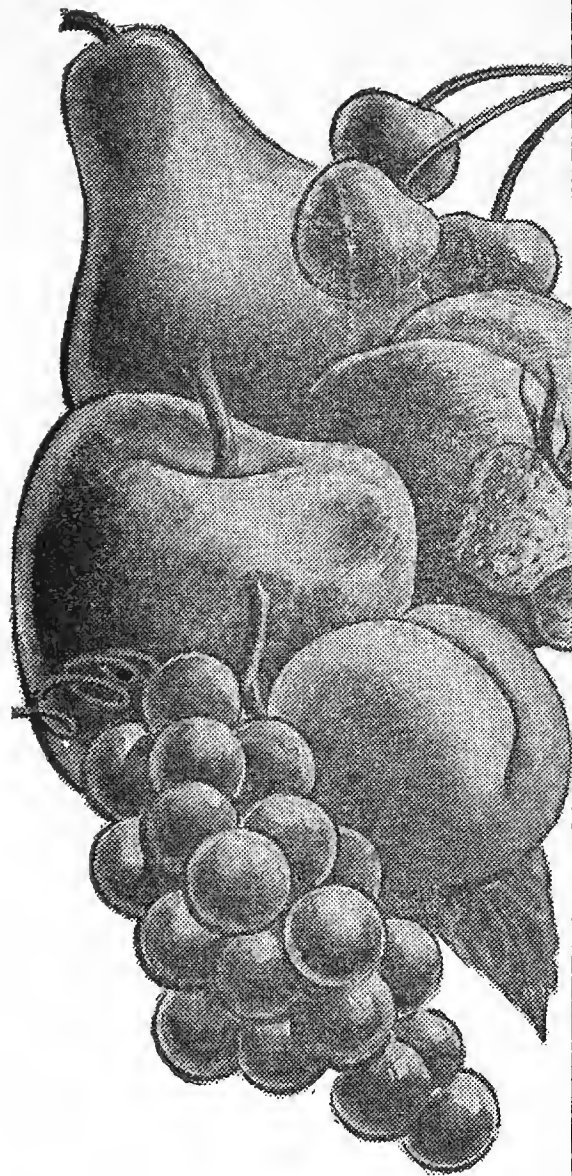
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BULLETIN OF ZOOLOGICAL NOMENCLATURE

Arrangements have been made for completing vol. 1, and for the publication of volumes 2 (applications in regard to nomenclatural problems), 3 (documents considered by the International Commission on Zoological Nomenclature at Paris, 1948), 4 (Official Record of the International Commission at Paris), and 5 (Official Record of the section on Nomenclature of the thirteenth International Congress of Zoology at Paris, 1948).

All inquiries regarding publications should be addressed to: International Trust for Zoological Nomenclature, 41 Queen's Gate, London, S. W. 7, England.



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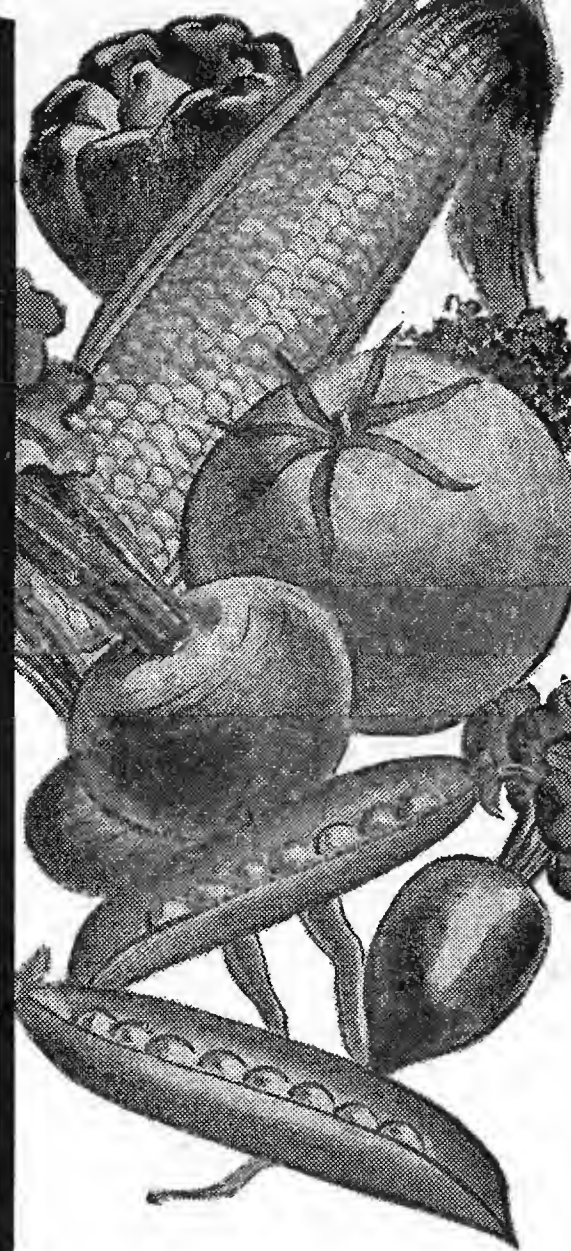
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